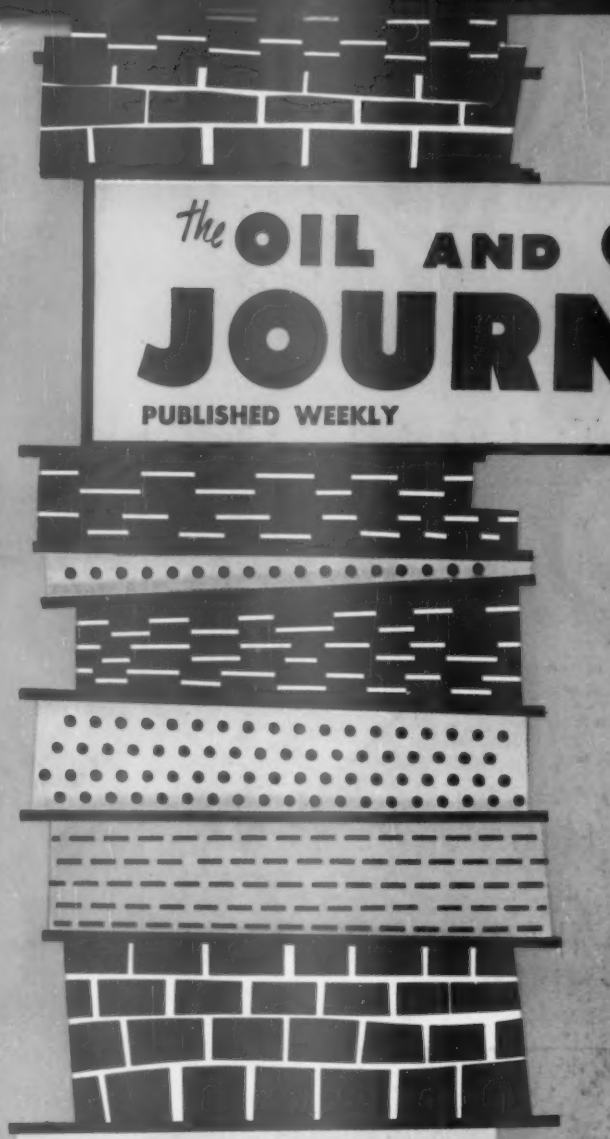
the OIL AND GAS JOURNAL
PUBLISHED WEEKLY
April 25, 1960



Journal 5-year study shows

How domestic crude markets have shifted

Exports to other states reveal

ROCKIES: Up 80%
TEXAS: Down 5.7%
LOUISIANA: Up 51.7%

p. 100

FPC probe could become explosive

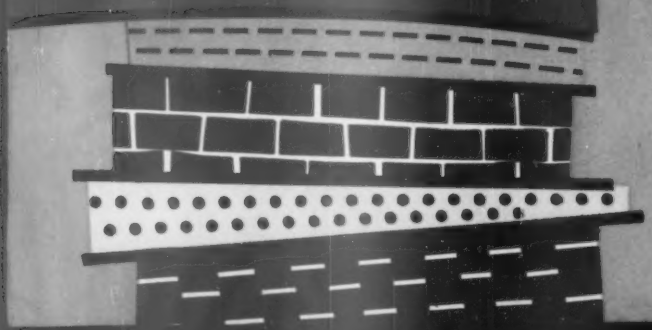
p. 97

Analog computer leads way to better control

p. 202

GEOLOGICAL-EXPLORATION

Special Section Beginning p.127



PROPHECY
...come true
The prophetic statement of Archimedes ... "Give me a lever long enough, a fulcrum strong enough, and a place to stand on — and I can move the world", has come true, due to the miracles of modern Petroleum Technology.
Modern Hydraulic Fracturing of subsurface reservoirs containing oil and gas, actually lifts the overburden of earth, and permits a more productive flow into the well bore.
Halliburton was and still is the pioneering leader in this ever-expanding technique to make possible a "movement of earth for greater profit", through formation fracturing.
HALLIBURTON
OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

OIL AND GAS JOURNAL
Vol. 58, No. 17

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Evaluating a Drillable Prospect 127

An illustrated outline of a simple method for compiling a composite montage designed to present at a glance all data necessary to evaluate an exploration prospect.

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By H. T. Anderson and H. Sommer

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Today's Active Oil Fronts

An on-the-spot study of the most rewarding and active oil exploration programs now under way throughout the U. S. and Canada. Some of them are new, some old, but all are of prime interest in today's exploration picture.

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SPECIAL FOLDED INSERT: The Journal's Formation Correlator of the United States. Here is a revised edition of a useful tool for the oil finder. The complete geologic section is traced across the country, region by region and state by state, with all productive formations so tagged. Also an insert map outlining the major U. S. sedimentary basins.

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the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
April 25, 1960

Gas industry itself may suffer from the FPC furor:

Talk in Washington is that any new disclosures could result in:

...Wholesale turnover of commission members.

...Ruin standing and influence of gas industry in government and legislative circles in Washington.

In fact, Connole could be first casualty. Tug of war is continuing over his fate. His chances of being reappointed appeared very dim at one point but support has rallied now.

An announcement is likely within next week or so on what President Eisenhower will do (p. 97)*.

Other steps on the Washington beat:

TIPRO will get its conference with Interior, Treasury, and Commerce department officials on "deterioration of the domestic producing industry in face of increasing import allocation."

Don't expect much to come of it, however, for the administration doesn't want to make any basic changes now.

Federal fair-trade legislation is dead for this session.

Bill which drew varying views from oil industry was pigeon-holed by the House rules committee last week in a surprise action.

Roosevelt subcommittee will hear oil company side of marketing practices story this week on Wednesday and Friday.

Several companies won't attend, figuring no good would come of it.

Site for first offshore underwater storage facilities of its kind has been picked near St. Petersburg Beach, Fla.

Pilot installation will consist of several collapsible tanks set into special cradles anchored to ocean floor. The tanks are made of rubber-impregnated and coated fabrics, impervious to the elements. They will withstand hydrostatic

---

*Refers to article in this issue giving more details. Where no page is given, the item is a Newsletter exclusive.

pressures and contents will remain at a mean temperature.

The tanks can be used for both civilian and military purposes to contain almost unlimited types of liquid and solid materials. Project is sponsored by Firestone, Global Marine Exploration, and Jet Fuel & Storage Co.

▼ ▼ ▼

Interesting changes in domestic crude markets over last 6 years are revealed in Journal statistical study (p. 100).

Two trends feature domestic crude movements:

...Increased importance of interstate crude shipments compared with movements within states.

...Greater market roles of crude from Louisiana and the Rocky Mountain region.

The three major oil states have moved to choke back production in effort to halt purchaser proration and undergird the price structure.

Texas went to 8 producing days. Oklahoma pared its May allowable 20%. Louisiana lopped off more than 30,000 bbl. daily for May and June (p. 108).

▼ ▼ ▼

Major structure in the Persian Gulf off the Neutral Zone apparently has been tapped by the Japanese-owned Arabian Oil Co.

The company has second big producer about 3 miles southwest of the discovery, which flowed at rate of about 6,300 bbl. daily from 500-ft. zone at 4,700-5,200 ft. Second well hit pay at about same depth and reportedly is just as big.

Other foreign reports: Mobil has its second discovery in Libya. Its Hofra 2 flowed 1,500 bbl. daily on test from 3,030 ft. (p. 125)...World's largest unitization project has gone into operation in Lake Maracaibo with four companies agreeing to handle own production on equity basis (p. 126)... Argentina's drilling and pipeline projects now promise to make nation self-sufficient in oil long before 1964 (p. 122).

Questions are raised by new Canadian regulations:

Provisions are not specific on Canadian participation in oil and gas development of areas under federal control.

A federal vs. province battle may be started by the offshore claim of the federal government (p. 107).

▼ ▼ ▼

Cause of 8-mile rupture of 30-in. pipe during testing of Transwestern Pipeline near Roswell, N. M., has captured interest of all pipeliners.

Their concern: What caused it. Cause may never be

known. Many possibilities exist, such as bad pipe from the mill, damage in transit, handling, or laying; or a defective field weld (p. 105).

Look for Trans-Canada to file for another export permit.
The big gas line has Canadian permission to export 204 million cubic feet daily to Midwestern Gas Transmission.
And it has an option to sell another 204 million daily to Midwestern. Trans-Canada hopes to exercise this option soon.

Easy way is sought to extend Louisiana gas severance tax.
Gov.-Elect Jimmie Davis is checking legality of continuing 2.3-cent levy by simply removing expiration date of August 1 from present law. This amendment would need only a majority vote of the legislature.
New tax measures need a two-thirds vote for approval.

Linking of huge Mocane and Laverne gas areas is official.
The northeast Oklahoma fields, found to be one producing area, run over 60 miles east-west, and 25 or more miles south-north.
The linking wells are Cabot Carbon Co.'s 1-15 Barby Ranch, 9 miles south of Knowles in Beaver County, and 1-11 Barby Ranch. The 1-15 is also a new pay in Lovell-Endicott sand. Flow was 6,270 M.c.f. daily.

▼ ▼ ▼

New wrinkle in customer relations.
Union Oil Co. of California has complimented by letter credit-card holders who pay promptly. Reaction has been favorable and an impressive number of customer "thank you's" have been received.

Average quality of regular gasoline may be stepped up during coming season (p. 104).
Signs of the trend: Spread between best and poorest quality is too large; compacts with high-octane appetites; and presence of several regulars already above 95 RON.

Licensing of service-station personnel opposed.
New Jersey's gasoline suppliers have united against a bill in the state assembly providing for the examining of service station operators, attendants and apprentices.
Pushing for passage is the state's Retail Gasoline Dealers Association.

Far away markets are eyed by Standard of California.
Guam and French Oceania are possible outlets for products from Standard of California's 32,000-bbl. refinery under construction near Honolulu. Completion is slated for mid-1962.

Market Memo

April 25, 1960

Demand controls oil prices like a tough umpire. And that's why the Group 3 gasoline-price hike was tagged out.

A price advance for unbranded gasoline—in heating-oil weather, in an oversupplied market—is like Aparicio trying to steal second base with Early Wynn perched there. He is out, and so was Group 3's price advance from 11 to 11½ cents per gallon for 91 research-octane gasoline.

An oversupplied independent refiner has set the tempo. He has continued a 10.75-cent flat price for deals the rest of April. That sets the spot market.

Back of whole trouble: Staggering gasoline stocks. U. S. stocks are up 12.05 million barrels over this time last year and 50% of this increase is in Mid-continent region. (For statistical details, see p. 271).

Gulf Coast gasoline prices are stalled with buyer on third base—with spot prices at one-half cent to five-eighths under posted prices. No spot sales are being made at these contraseasonal prices.

Mississippi River markets are holding gasoline at one-quarter cent off Gulf Coast for midriver terminals. West Memphis prices could be three-eighths cent off Gulf Coast if competition is desired.

No. 2 has calendar strength in the Gulf Coast. Contract negotiations for the 1960-61 East Coast seasonal demand are starting.

East Coast and Gulf Coast depleted storage portends a favorable climate for No. 2 contract prices for next winter's demand. Current spot purchases of No. 2 can be made at three-eighths to one-half cent off posted price of 8 cents gallon.

No. 6 price trends? It would take a psychiatrist with a couch on his back making house calls in Washington, where the trouble is, to figure them out. Gulf Coast No. 6 is at $2.10 per bbl. New York harbor cargo market is posted at the same price. But quota No. 6 is being laid in at New York at $1.85 per bbl. Current supply on East Coast is about half the demand.

Another big buyer is expected soon to meet Sinclair's posting in East Texas. You now can buy the same top quality sweet crude there at four different prices—cash and carry at $3.25, $3.15, $3.10 and $3.05.

It's a screwy market across the board.

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WHERE YOU WANT IT
WHEN YOU NEED IT...
AT REASONABLE
COMPETITIVE PRICES

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ILLINOIS—Centralia, Clay City, Salem

KANSAS—Chanute, Cedar Bend, Liberal, Pratt, Russell, Wichita

LOUISIANA—Shreveport

NEW MEXICO—Farmington, Hobbs

OKLAHOMA—Bartlesville, Oklahoma City, Perry, Ponca City, Tulsa

TEXAS—Amarillo, Borger, Colorado City, Dallas, Kilgore, Longview, Odessa

Buy from Bovaird

Bovaird

SUPPLY COMPANY

TULSA, OKLAHOMA

50 YEARS OF PROGRESS WITH THE OIL INDUSTRY

PESA

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

PARTNERS IN PETROLEUM PROGRESS

Bechtel Completes One Job, Starts Two More in

CONTINENTAL'S WESTLAKE REFINERY

Last December Bechtel completed a new Catalytic Desulfurizer and the Refinery's second Catalytic Reformer for Continental Oil Company at Lake Charles, Louisiana. The new facilities were constructed in less than 5 months. Work starts this spring on a new light ends Depropanizer Unit and an additional petrochemicals stream fractionator. These two units are scheduled for completion by mid-summer. The Depropanizer will process all light ends from the Refinery's crude topping units plus a large volume of raw product pipelined to the Refinery from nearby gasoline plants.

In an area where difficulties have been experienced in the past, good jobsite management finished the project on schedule and kept costs under close control – including direct labor costs. This story should interest oil company executives responsible for engineering and construction.

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Whyte Strand is available in 2 grades: Monarch Whyte Strand and PREmium Whyte Strand, with 15% greater strength. The correct line for your equipment is available from your Macwhyte distributor.

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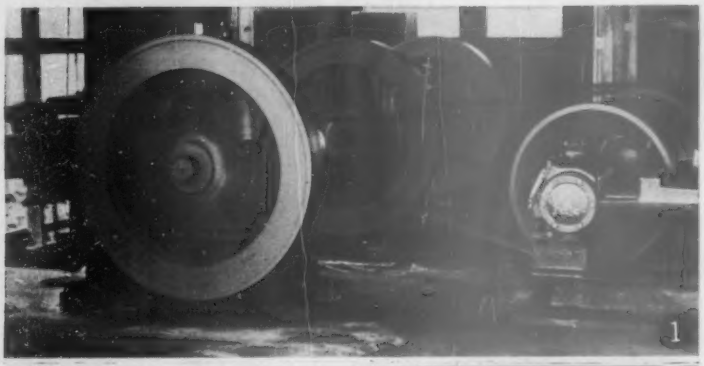
189

More Texas producers choose Witte Engines for waterflooding



Whether for driving your waterflood pumps or operating your pumping units . . . Witte Engines will give you steady service, low maintenance and reliability. These are the reasons why more Witte gas or gasoline engines are being used as prime movers on oilfield projects in Texas and elsewhere. Their smooth-running characteristics make them adaptable for wide-base pumping units with minimum foundations for the engines.

A full line of heavy-duty engines is available in sizes from 3¾ to 42 horsepower. Many in this line are convertible to full diesel. Complete information on them is available through all oil field supply stores.

USS and Witte are registered trademarks

1. Three Witte F-28 Engines driving pumps on a waterflood near Wichita Falls, Texas. The engines have been in service approximately two years. Approximately 2,000 gallons of water are injected daily in 80 wells, with natural gas used as fuel.

2. Installed on a wide base pumping unit, this Witte F-42 Engine is a prime mover for a producing well on a waterflood near Haskell, Texas. The well produces approximately 300 barrels of oil per day from 3,800 feet. L.P. gas is used as fuel.

3. This is one of three Witte F-28 Engines in use as power source for pumping oil from waterflooded wells in the vicinity of Bowie, Texas. Engine illustrated is on a well producing approximately 400 barrels of oil per day from a depth of 4,100 feet. The engine is equipped with a Witte installed "Automatic Water Make-up Kit" for extended and unattended operation.

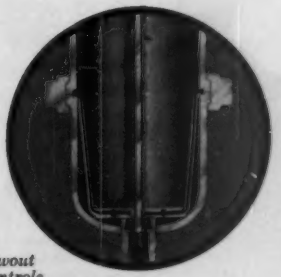
Witte Engine Works
Oil Well Supply
Division of
United States Steel

USS

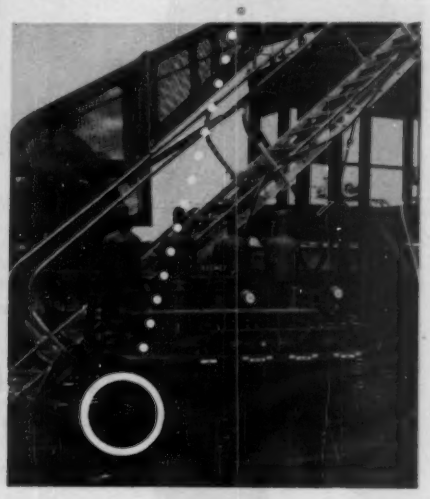
Offices and Plant: Kansas City 26, Missouri

Another new development using

B.F.Goodrich Chemical *raw materials*



Koomey blowout preventer controls manufactured by Stewart & Stevenson Distributing Company, Houston, use bladders made of Hycar by Oteco Equipment Company, Houston. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.



500,000 cycles prove toughness of Hycar accumulator bladder

Before the bladder made of Hycar nitrile rubber shown above was approved for use in accumulators like the one in the background, it was tested for more than half a million cycles under highest pressures—with no signs of failure.

The toughness and resilience that even 500,000 cycles can't affect is only one advantage provided by Hycar. Its unusual ability to resist deterioration provides longer, surer, safer operation for this and other oil field equipment. Hycar resists chemicals, oils and solvents that destroy ordinary rubber.

Here's another example of why it pays to specify Hycar everywhere in oil fields. For more information, write Dept. FH-3, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar

Rubber and Latex

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a division of The B.F.Goodrich Company

See our catalog in Sweet's Product Design File.

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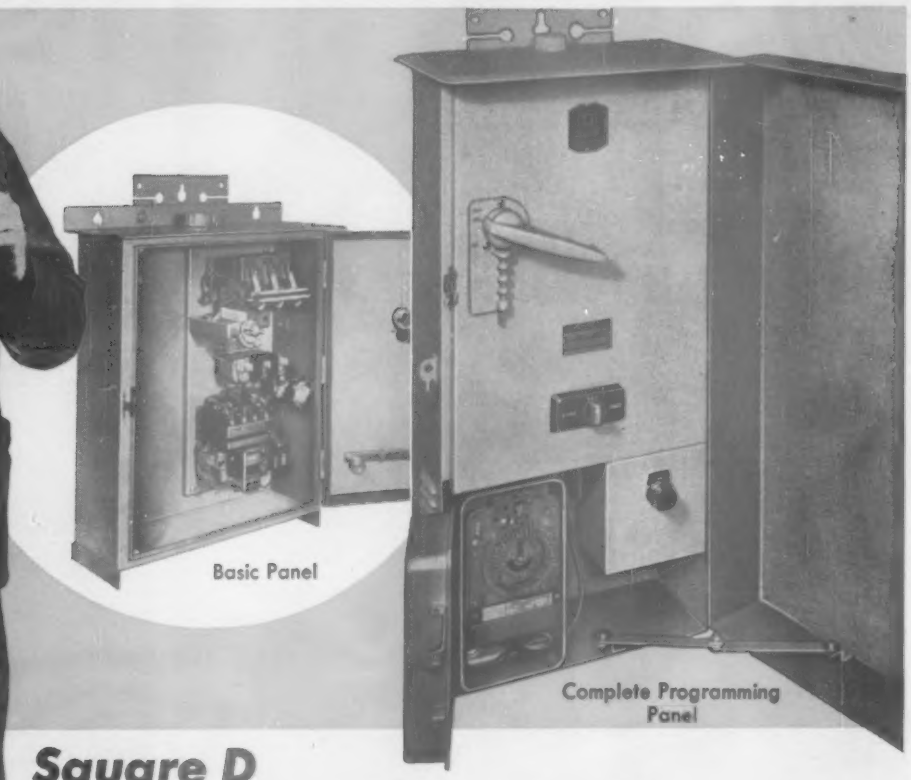
GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

"What kind of Pumping Control do YOU need?"



Square D can deliver it from Stock!

BASIC PANEL can be tailored to fit your needs—

- NEMA Type 3 "weatherproof" enclosure protects against rain, sleet, hail, snow and dust.
- simplified installation—convenient knockouts for easy wiring, designed for either wall or pole mounting, or available with pedestal mounting feet if desired
- oversized enclosure permits field installation of additional features if required
- choice of fusible disconnect switch or circuit breaker
- HAND-OFF-AUTO selector switch
- available in ratings up to NEMA Size 4 to handle up to 100 hp

COMPLETE PROGRAMMING PANEL has every feature you need for oil well pumping—

- two types—one for operation up to 600 volts, another for 762-volt systems
- gasketed inner door isolates "live" parts—NEMA Type 3 enclosure gives complete weather protection
- overload relays in separate ventilated compartment to prevent nuisance tripping
- time clock has trip tabs for easy pumping program setup
- undervoltage release relay drops out on power failure, provides time-delay restart for staggered starting when power is restored
- built-in lightning arrester

Write for Bulletin 8944. Square D Company, 4041 North Richards Street, Milwaukee 12, Wis.

SQUARE D COMPANY

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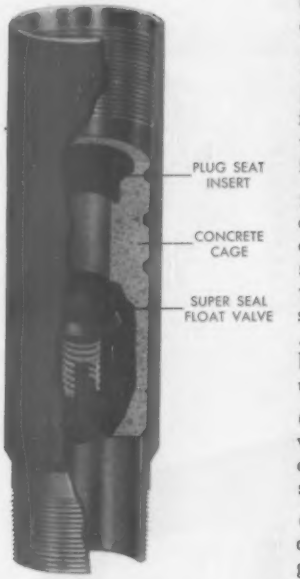
THE DIFFERENCE IS IN THE DESIGN

Design makes the *Big Difference* when it comes to downhole casing equipment. It takes high quality, well designed tools . . . and skilled operating personnel – highly trained and experienced in using these tools in the field to give you faster, more efficient cementing service. Here are some of the downhole equipment features that make the Big Difference . . .



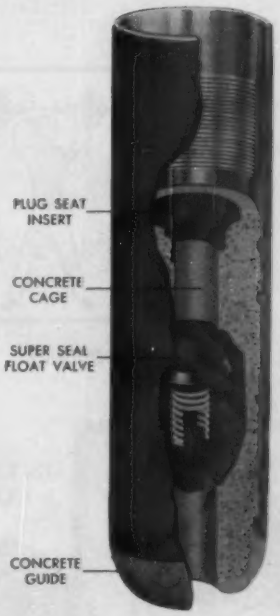
SUPER SEAL FLOAT COLLAR AND FLOAT SHOE

PLUG SEAT INSERT is carefully manufactured from a phenolic impact compound. Its seating area is designed to mate perfectly with the bottom cementing plug and shut off the casing below from the displacement fluid following the cement.

SUPER SEAL FLOAT VALVE is the heart of the tool. The conical band contact design of the valve seat gives a more effective seal with the rubber sealing ring and lowers unit stress at the point of contact. Action of the fluid *closes* the valve going in the hole, causing the well fluid to partially support the casing load . . . *opens* for the passage of cement . . . and *seals* against back pressure to keep cement in place behind the casing. Recommended for wells with temperatures up to 400° F.

CONCRETE CAGE surrounds and tightly secures the float valve assembly and plug seat insert to the outer steel grooved coupling. The concrete has high compressive and shear strength, but presents no drilling out problem.

CONCRETE GUIDE built into the Super Seal Float Shoe is designed to withstand the roughest of treatment. The rounded guide directs the casing away from ledges to minimize sidewall cavings.



HOWCO WELD — FOR STRONGER JOINTS WHERE IT COUNTS MOST
This economical thread compound is superior to tack welding as an aid in locking threaded connections. Excellent for use on floating equipment and the bottom two or three joints of casing to provide the necessary bond to help prevent threaded connections from breaking out . . . without welding. This easy-to-use material provides a bond at a fraction of the cost of welding . . . and based on tests is actually 50% stronger than a tack welded joint.

INVESTIGATE THESE HALLIBURTON PRODUCTS. THEY ARE TYPICAL OF THE ADVANCED DESIGN YOU'LL FIND THROUGHOUT THE HALLIBURTON LINE.

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Sure! LUFKIN UNITS ARE HEAVIER!

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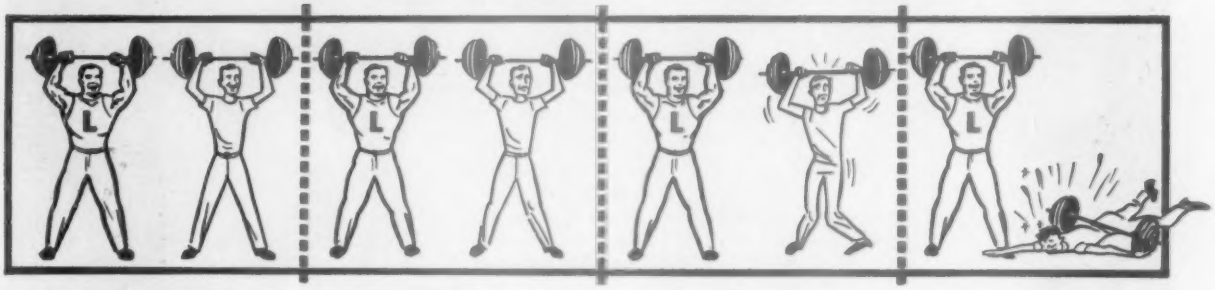
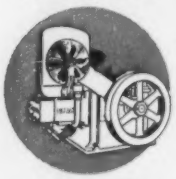
has been the LUFKIN motto from the very beginning . . . a policy that has given LUFKIN units a reputation for UNSURPASSED ENDURANCE and PERFORMANCE . . .

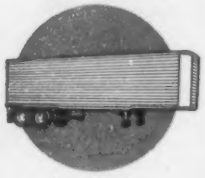


GOOD ENOUGH | WE WONDER . . . | . . . LATER | WUPS

PUMPING UNITS



GAS ENGINES



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STATEMENT OF CONDITION

At the close of business . . .

March 15, 1960

RESOURCES		
Cash and Due from Banks	$98,281,657.50	
U. S. Government Securities	63,485,524.36	
Other Bonds and Warrants	10,575,025.71	$172,342,207.57
Loans and Discounts		95,740,711.59
Income Receivable Accrued		553,922.93
Stock in Federal Reserve Banks		420,000.00
Bank Premises		4,000,000.00
Customers Liability Under Letters of Credit		323,344.00
TOTAL		$273,380,186.09

LIABILITIES		
Deposits		$250,561,026.77
Letters of Credit Outstanding		323,344.00
Income Collected, not earned		555,739.75
Reserve for Taxes, Interest, Etc.		1,031,196.82
Capital—Common	5,500,000.00	
Surplus	8,250,000.00	
Reserve for Common Stock Dividend	250,000.00	
Undivided Profits and Reserves	6,908,878.75	20,908,878.75
TOTAL		$273,380,186.09

NATIONAL BANK OF TULSA

OIL BANK OF AMERICA

Member Federal Deposit Insurance Corporation

U-36 ELECTRA-FLOW RIG

Electric power for complete rig operation is provided by two Cummins VT-12 TURBODIESEL Engine and GT-602 generator combinations.

Power to the U-36 Drawworks is supplied by a General Electric GE-752 motor. An identical motor powers the mud pump.

Mid-Continent Engineered for Medium-depth Drilling

Reduced rig-up time, less maintenance, and efficient power distribution are features of an all-electric, medium-depth rig engineered by Mid-Continent for Slats Honeymon Drilling Company. Now drilling in Oklahoma, the rig is designed around a Mid-Continent U-36-A Drawworks rated at 300 to 600 net input horsepower. This type rig offers excellent portability for fast moves over difficult terrain, and flexibility in rig-up on rugged locations. Whether you may be considering Electra-Flow or mechanical drive, call Mid-Continent for complete information on the U-36.

DW5-0

MID-CONTINENT SUPPLY CO.

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

Mid-Continent Building, Fort Worth, Texas • Export Division: 45 Rockefeller Plaza, New York 20, N.Y. Cable: MIDCUMPORT NYK

TAKE PROBLEMS OUT OF PRODUCTION WITH THIS SIMPLE FORMULA

In other words the advanced Brown HS-16-1 hydraulically set packer in your well EQUALS profit plus.

It's simple arithmetic—packers produce either more profit or less. The Brown HS-16-1 will produce more profit because it was designed to solve more production problems.

It's easy to work out your own solution. Check the advantage chart for extra profit possibilities on your next completion.

A. Multi-purpose HS-16-1 can be used for all these applications:

A1. As a packer for single zone completion.

A2. As a packer for single-string dual completion.

A3. As the lower packer in a multiple-string completion.

A4. As the packers (any number in the same well) for multiple alternate-zone installations.

A5. An excellent packer where acidizing or fracturing is being done. Dual slips enable the packer to withstand high differential pressures – pressure exceeding tubing limit.

B. Going in – the HS-16-1 offers these advantages:

B1. Savings in rig time while running and setting. Ample by-pass area allows free flow of well fluid around the packer.

B2. Circulation with the well head in place, and before setting the packer eliminates wire line work.

B3. The HS-16-1 is easily run in straight or deviated holes.

B4. No difficulty in running the packer into the top of a liner.

C. Setting the HS-16-1 is a simplified operation:

C1. No tubing manipulation necessary to set packer.

C2. Design eliminates the possibility of premature setting.

C3. The "hydraulically-set" feature minimizes the problem of spacing out.

C4. Positive well control is achieved since the well head is installed *before* the packer is set or drilling fluid displaced.

C5. Producing zones may be washed *after* the well head is installed.

C6. Set at any depth as no tubing weight is required when setting. Hydraulic setting allows the tubing to remain in tension due to its own weight.

C7. Treating fluid may be spotted across the producing zone before the packer is set.

D. Coming out – the HS-16-1 has two big advantages:

D1. A fully retrievable packer, the HS-16-1 can be rerun after servicing. The cost of drilling and replacing a permanent-set packer is eliminated.

D2. Swabbing action while pulling is minimized by the built-in equalizing valve and the ample by-pass area around the packer.

The Brown HS-16-1 packers are available in all popular sizes or to your specifications on special order. Just call one of our representatives—they serve production areas throughout the free world.

BROWN OIL TOOLS, INC.

8490 KATY ROAD P. O. BOX 19236,
HOUSTON 24, TEXAS

Edmonton, Alberta

CLOSE TO HOME, PUMP-WISE AND SERVICE-MINDED!

—Your Gaso Distributor

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Shreveport, La.

Wichita Falls, Texas

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Bakersfield, Cal.

Farmington, N.M.

Long Beach, Cal.

GASO DISTRIBUTORS BRING GASO SERVICE TO YOUR BASE OF OPERATIONS

We screen and pick our distributors with the utmost care. We bring their organizations to Tulsa for thorough training in oil-industry pumps and their application. We insist that they carry stocks of Gaso Pumps and parts.

Result: Complete Gaso service at your doorstep. Time-saving. Convenient. Still another explanation of the worldwide preference for Gaso Pumps.

GASO PUMP & BURNER MFG. CO.
FIRST and LANSING STS., TULSA, OKLAHOMA
EXPORT OFFICE: 2712 EMPIRE STATE BLDG.
NEW YORK, N. Y.

GASO PUMPS

for every oil industry need

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1960-61
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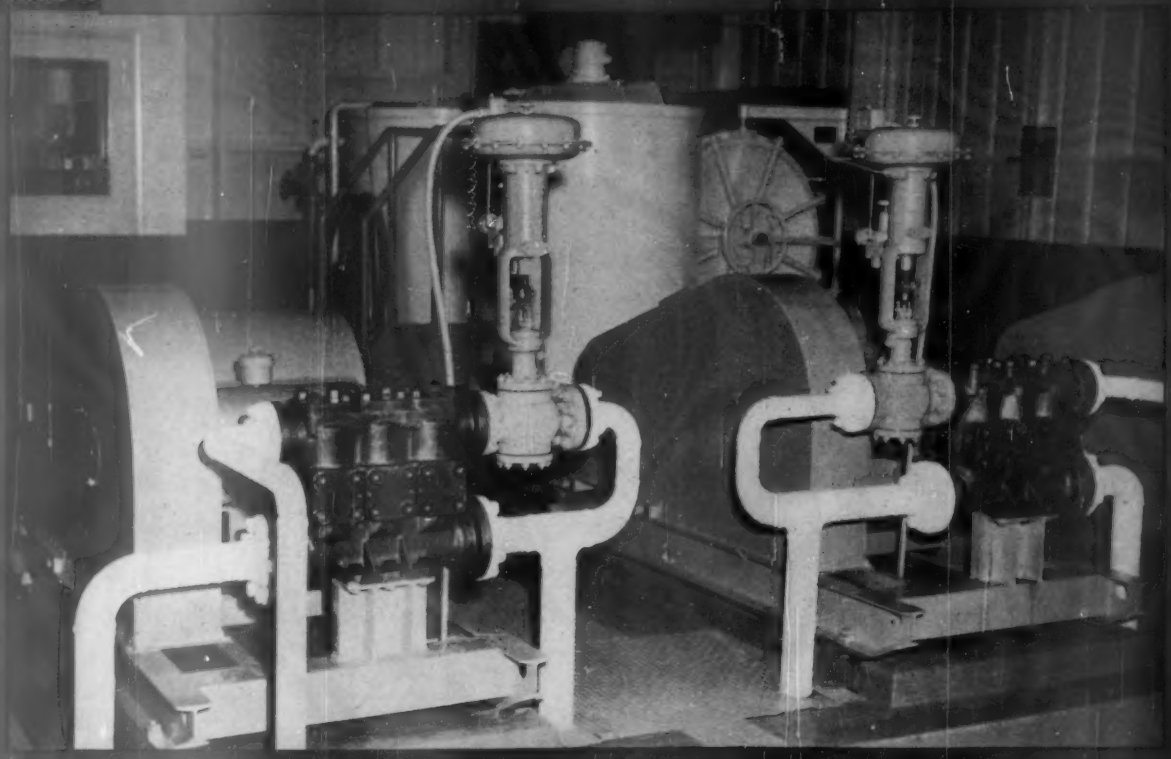
WORLD WIDE PRESTIGE

GASO PUMPS

WHAT'S BACK OF GASO LEADERSHIP IN

WATER FLOODING?



There's a Single-Word Answer: PERFORMANCE

The photograph shows one of a steadily mounting number of Gaso installations in water flooding service.

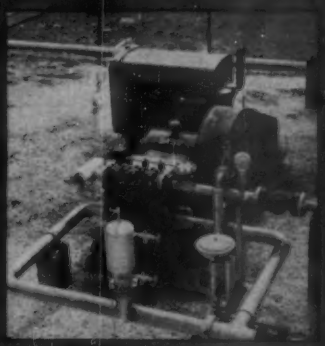
The injection pumps (3) are Fig. 3365, 1¾" x 3" Gaso Horizontal Triplex Plunger Pumps, driven by 40 HP 1200 RPM electric motors.

The fluid ends are of aluminum bronze fitted with ceramic plungers, non-adjustable type plunger packing (in both power and fluid ends) and Bakelite insert type valves mounted on Monel valve seats.

Each of the three pumps, operating at 350 RPM, delivers approximately 1075 barrels a day at 1500 pounds discharge pressure.

Complete adaptability to the job plus GASO design throughout is a time-tested guarantee of thoroughly dependable service extending far beyond the normal life expectancy of pumping equipment.

In the GASO line you will find the effective answer to any pumping problem associated with water flooding. Write for our 1960-61 catalog, or get in touch with our nearest distributor.



Gaso Pumps in salt water disposal service in Louisiana

GASO PUMPS

for every oil industry need

GASO PUMP & BURNER MFG. CO.
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OIL KING!

Acknowledged so

by oil men who have used all kinds of gauges

The ten-gallon hat on the Marsh Mastergauge is worn as a crown of acceptance, an emblem of excellence... well earned through years of rugged oil country service.

Just as kings ascend thrones through lineage, the Mastergauge was destined for "royal" acclaim the day it hit the drafting board. Because every product born at Marsh is "born to the purple."

For what other gauge has the Marsh heritage of functional design innovations? Only Marsh offers Conoweld construction, the Marshalloy case, "coined" sector Mastergauge movement, "Recalibrator" adjustment, and optional Safecase protection plus.

That's why we say the *next* great thing that happens in gauges will happen at Marsh.

MARSH INSTRUMENT COMPANY, Dept. L, Skokie, Ill.
Division of Colorado Oil and Gas Corporation
Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta
Houston Branch Plant, 1121 Rothwell St., Sect. 15, Houston, Texas

MARSH GAUGES

In stock at your nearest Supply House

"THE STANDARD OF ACCURACY"

Installed on caustic lines in 1930, these Rockwell-Nordstrom lubricated plug valves needed only cleaning before installation in new plant.

THE VALVES THAT WOULDN'T RETIRE

The Rockwell-Nordstrom lubricated plug valves shown above were two of dozens installed in 1930 on caustic lines at a process plant. When the plant was torn down in 1959, the valves were still in such good condition that they're being used on the same service in the new plant.

The above story is just one more example of the ruggedness of Rockwell-Nordstrom valves. Since they're sealed positively against leakage by pressurized lubricant and there are no exposed metal-to-metal seats, you get positive shut-off year after year. And, lubrication is preventive maintenance against the high cost of repairs, replacement and downtime. To get complete details on Rockwell-Nordstrom, the original and world's most complete line of lubricated plug valves, lubricants and accessories, write: *Rockwell Manufacturing Company, Pittsburgh 8, Pa.; Canadian Valve Licensee: Peacock Brothers Limited, Montreal, Quebec; Rockwell International S.A., Geneva, Switzerland.*

Lubrication Makes The Difference

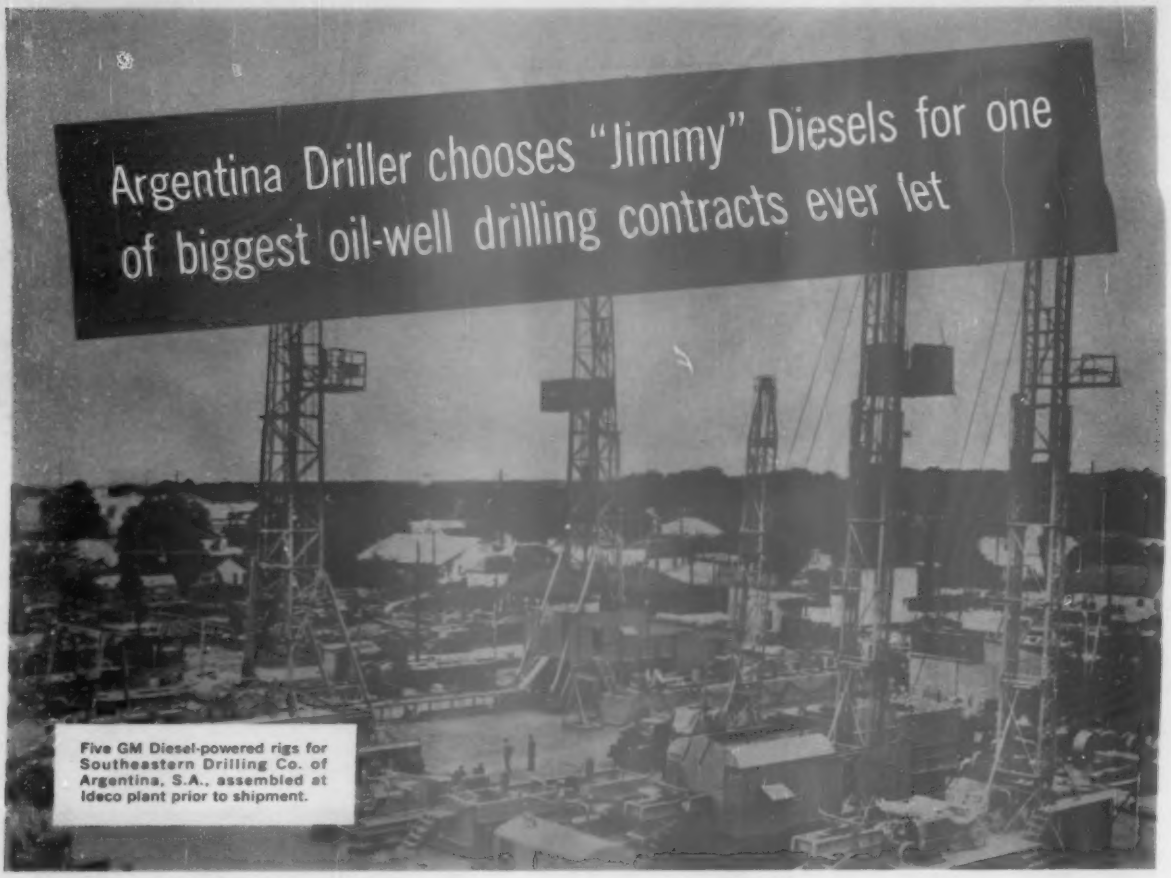
ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL

These 175-lb WOG Rockwell-Nordstrom valves have already given years of trouble-free service on production header controlling 16 wells in West Texas lease.

GET REAL PRODUCTIVITY



Five GM Diesel-powered rigs for Southeastern Drilling Co. of Argentina, S.A., assembled at Ideco plant prior to shipment.

On a 1000-well, four-year drilling project just started, Southeastern Drilling Co., of Argentina, S. A., has chosen GM Diesel power for both rigs and vehicles.

Seventeen 12V-71's are being put to work on Ideco drawworks and mud pumps; nine Series 71E "Twins" on Ideco completion rigs; seventeen 6-71E's in a fleet of transport trucks; nine 4-71's and four 6-71's on generator sets—a total of 56 GM Diesel single and "Twin" engines in all.

The reason? Southeastern's 10-year experience with a fleet that now totals 284 GM Diesels—the engine's long-life dependability and high interchangeability of parts—features no cost-conscious multi-rig operator can afford to overlook.

Whether you operate one rig or fifty—at home or abroad—be sure to check these other GM Diesel advantages:

Low first cost • Low parts cost • Long life between overhauls • Faster response to loads.

And with new "V" engines like those being used on

GM DIESEL ALL-PURPOSE

FREE!
DIESEL VS.
GASOLINE
OPERATING
SAVINGS
COMPUTER
GM
GENERAL MOTORS
GM
DIESEL
OPERATING SAVINGS
COMPUTER
COMPARING YEARLY FUEL COSTS
FOR GASOLINE AND DIESEL ENGINES
TRUCKS
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DIESEL
OPERATING SAVINGS
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Please send me my GM Diesel
Operating Savings Computer:
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BUSINESS REPLY CARD

5¢ POSTAGE WILL BE PAID BY

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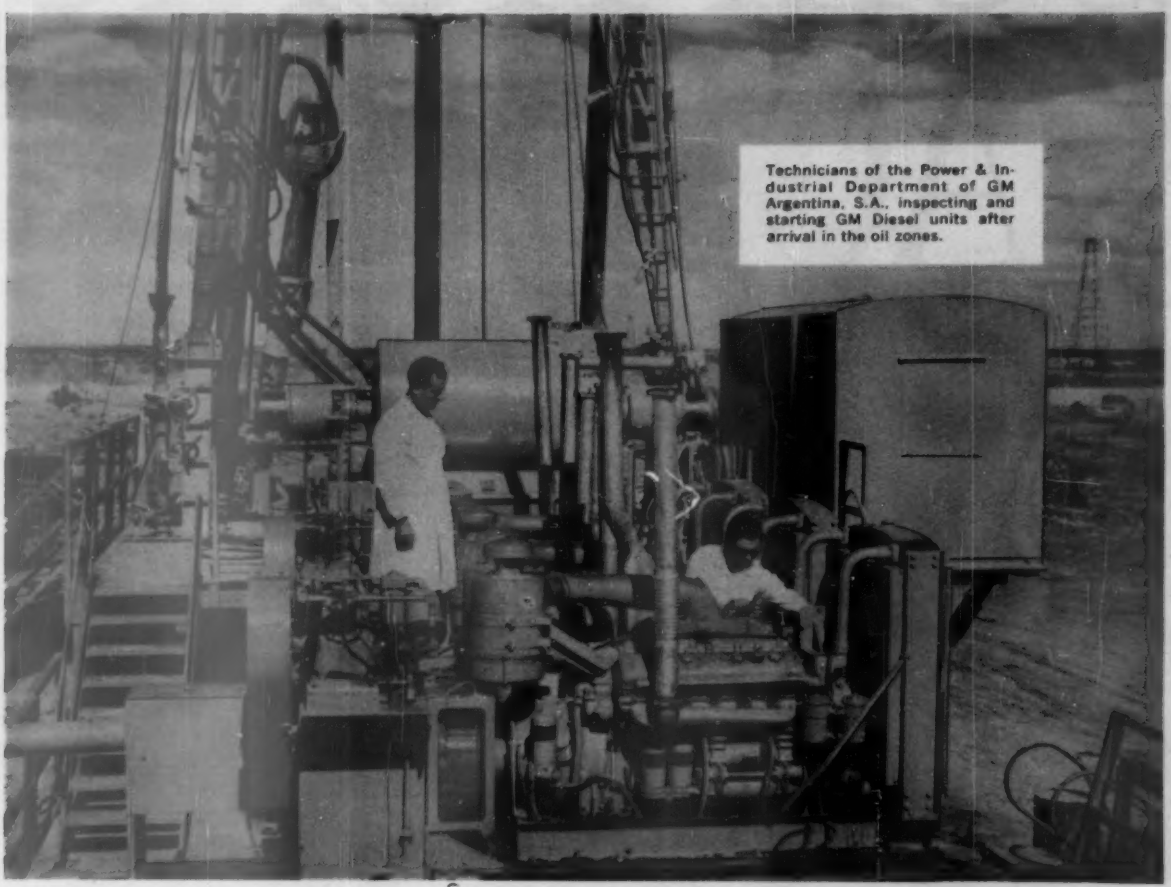
Section 34.9
P.L. & R.
Detroit, Mich.

GM DIESEL
13400 West Outer Drive
Detroit 28, Michigan

Dept. OGJ-2

GET A GM DIESEL ENGINE



Technicians of the Power & Industrial Department of GM Argentina, S.A., inspecting and starting GM Diesel units after arrival in the oil zones.

Southeastern's drawworks and pumps, operators are getting more power from smaller, lighter engines—extra power that helps their equipment do more work per tour, per day, per month.

Learn how these compact, lighter-weight-per-horsepower "Jimmy" Diesels can step up *your* productivity—cut *your* drilling costs. See your GM Diesel distributor (he's in the Yellow Pages), or send the postcard for full information.

GM DIESEL

DETROIT DIESEL ENGINE DIVISION, GENERAL MOTORS, DETROIT 28, MICH.

In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario

Parts and Service Worldwide

POWER LINE

Sets the standard of Diesel productivity

SULPHURIC ACID

to 1/10th of 1%

Tailor-made for YOUR Process

as delivered

Do you use 100.3%? Or 96.1%?

You name it and we deliver it ready for your processing line.

What's more . . . deliveries are prompt and dependable. Consolidated's big fleet of tank cars, trucks and barges is handled by an exceptionally skilled traffic department. Movements are traced day by day . . . and we load and start shipments so they reach you on time.

And don't forget . . . if spent sulphuric acid is one of your problems, our regeneration facilities at Houston and Baytown, Texas; at Baton Rouge, La., and Hammond, Indiana, are the largest in the world. Virgin water-white H_2SO_4 from any processable acid we can pump out of barge, car or truck!

Sulphuric Acid is also shipped from Ft. Worth and Corpus Christi, Tex., LeMoyne, Ala., Los Angeles and Richmond, Calif., and Tacoma, Wash.

Stauffer CHEMICALS SINCE 1885

STAUFFER CHEMICAL COMPANY

380 Madison Avenue, New York 17, New York

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CONSOLIDATED CHEMICAL INDUSTRIES DIVISION, 6910 Fannin St., Houston 25, Texas

75 YEARS OF SERVICE TO INDUSTRY AND AGRICULTURE 1885 1960

sharp

AMERICAN BI-METAL THERMOMETERS make
accurate temperature readings sharp and sure at all check points

American Dial Thermometers are also available in mercury, vapor pressure, and gas actuation . . . on-the-spot and distant reading types . . . in sizes, ranges and stem lengths to meet your most exacting requirements.

sensitive

Any way you look at an American Bi-Metal Thermometer, you see exact working temperatures.

The two-level "Maxivision®" dial eliminates parallax effects. Numerals are on the lower level. Graduations are on the outer raised ring dial which presents a sheared edge to the tip of the pointer and in the same plane. To make readability even more accurate, the glass and graduated dial are closely spaced.

American Bi-Metal Thermometers are made of weather-proof stainless steel. All joints are welded to solid unity, then polished smooth so corrosion won't build up and destroy the thermometer's usefulness. And, you don't have to discard this thermometer even if the glass is ever broken. The bayonet lock bezel makes replacement easy.

Learn about the high sustained accuracy and long service life built into American Bi-Metal Thermometers. Phone your nearby industrial supply distributor for help in selecting the right type for each temperature check point in your plant. Or write for Catalog 100A.

MAXWELL MANNING M&M & MOORE INC. TRADE MARK

AMERICAN INDUSTRIAL THERMOMETERS
A product of
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SEALING AGAINST SOLVENTS, CRUDE OIL, CRESOL, GASOLINE...

VITON® PACKINGS UNHARMED BY 2 YEARS' FLUID EXPOSURE

With the reputation that VITON synthetic rubber has built for heat resistance (serviceable at 450° F. and up), engineers sometimes overlook the value of its outstanding performance in contact with fuels, oils, solvents and chemicals. Here is an application* where fluid resistance was the *only* problem . . . and VITON the only answer.

In 1957, General American Transportation Corporation installed a new fluid loading system at its tank farm in Galena Park, Texas. Swivel joints on the system required packings made of rubber. The problem: what rubber could handle crude oil, solvents, gasolines, cresol and sodium cresylate—to mention just a few of the fluids in storage? The answer: Du Pont VITON.

For well over two years, packings made of VITON, Du Pont's new fluoroelastomer, have been used in General American's tank car loading system to handle more than 80 different fluids. A recent visual inspection revealed no swelling, no deterioration and not a trace of product leakage. What's more, every packing originally installed (72 in all) is still in service.

• • •

Outstanding resistance to oils, fuels, solvents and chemicals, as well as to elevated temperatures, has helped VITON improve performance of refinery valves, heat exchangers, pumps and a wide range of industrial equipment. Write for specific data on the heat and fluid resistance of this new elastomer. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Department OG-4, Wilmington 98, Delaware.

*This case history from the ELASTOMERS NOTEBOOK—subscription free on request.

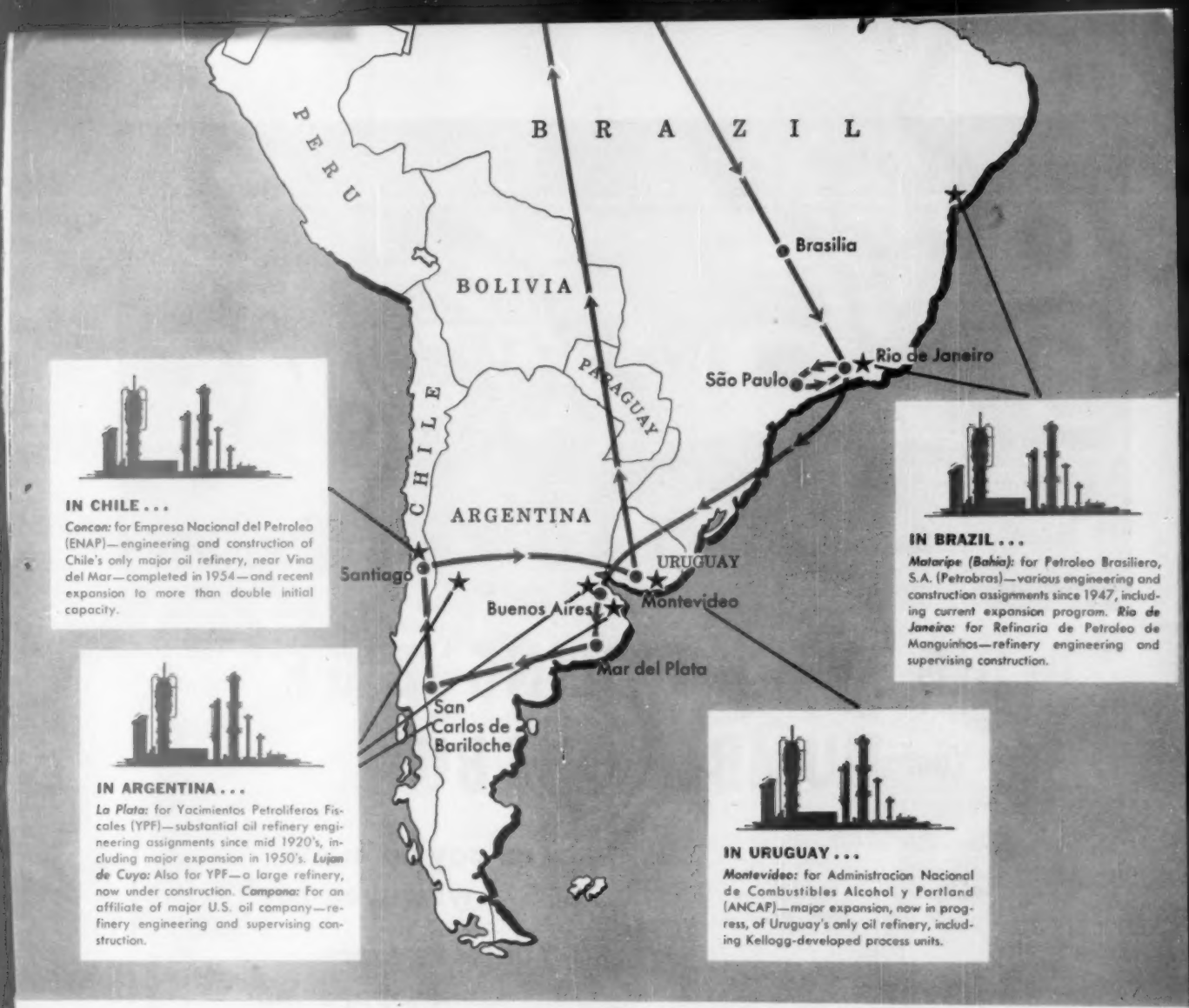
PROPERTIES OF VITON

Hardness Range	60-95 Shore A
Tensile Strength	Over 2,000 psi.
Temperature Range	—40° F. to 600° F.
Chemical Resistance	Excellent
Oil Resistance	Excellent
Compression Set Resistance	Very Good
Ozone Resistance	Outstanding
Flame Resistance	Good
Sunlight and Weather Resistance	Very Good
Abrasion Resistance	Good

DU PONT
REG. U. S. PAT. OFF.

SYNTHETIC RUBBER
NEOPRENE HYPALON® VITON® ADIPRENE®

Better Things for Better Living . . . *through Chemistry*



IN CHILE . . .

Concon: for Empresa Nacional del Petroleo (ENAP)—engineering and construction of Chile's only major oil refinery, near Vina del Mar—completed in 1954—and recent expansion to more than double initial capacity.

IN ARGENTINA . . .

La Plata: for Yacimientos Petroliferos Fiscales (YPF)—substantial oil refinery engineering assignments since mid 1920's, including major expansion in 1950's. ***Lujan de Cuyo:*** Also for YPF—a large refinery, now under construction. ***Campana:*** For an affiliate of major U.S. oil company—refinery engineering and supervising construction.

IN BRAZIL . . .

Mataripe (Bahia): for Petroleo Brasiliero, S.A. (Petrobras)—various engineering and construction assignments since 1947, including current expansion program. ***Rio de Janeiro:*** for Refinaria de Petroleo de Manguinhos—refinery engineering and supervising construction.

IN URUGUAY . . .

Montevideo: for Administracion Nacional de Combustibles Alcohol y Portland (ANCAP)—major expansion, now in progress, of Uruguay's only oil refinery, including Kellogg-developed process units.

BROKEN LINES TRACE PRESIDENT EISENHOWER'S RECENT SOUTH AMERICAN TRIP. SOLID LINES INDICATE MAJOR KELLOGG PROJECTS IN THE COUNTRIES VISITED.

KELLOGG ENGINEERING, TOO,

BUILDS GOODWILL

For many years, Kellogg has been building a firm foundation of understanding and goodwill in Argentina, Brazil, Chile and Uruguay—the countries recently visited by the President. Kellogg has played an important part in helping each of these nations establish and expand their oil refining industries.

In each of these nations, Kellogg is experienced in all phases of establishing new plants—including engineering, procurement, construction, and the numerous problems surrounding importing special equipment and materials. There are permanent Kellogg organizations in Brazil and Argentina staffed with South Americans and North Americans who are thoroughly familiar with the customs and practices of this part of the world.

FOR UNITED STATES FIRMS planning plants in these countries or in countries to the north, Kellogg offers its unparalleled experience. Kellogg will send, on request, descriptions of its activities in each or all of these countries, as well as the brochure entitled "Planning the New Plant for Profits"—which describes the Kellogg organization and how it operates.

THE M. W. KELLOGG COMPANY

711 Third Avenue, New York 17, N.Y.

A Subsidiary of Pullman Incorporated

Offices of Kellogg subsidiary companies are in Toronto, London, Paris, Rio de Janeiro, Caracas, Buenos Aires

The BIG 3* makes the FAILING "BIG F" Your NUMBER ONE BUY!

Yes — rig costs come in threes: Initial investment . . . Operating costs . . . Trade-in or re-sale values! That's why, with Failing rigs, you profit on the long pull! Your initial investment is no higher . . . your operating costs are lower . . . and your re-sale values are higher!

AROUND-THE-CLOCK SERVICE, TOO!

Failing is proud of the service it gives to its customers. Around the clock . . . around the world . . . we take care of your needs promptly and efficiently from our large inventory of spares and replacement parts.

***1** You pay no more when you buy!

***2** You save more while operating!

***3** You get more when you sell!

SUPPLY STORES are strategically located in the U.S.A. and Canada.

PHOTO ABOVE—shows Failing CFD-1B Combination Rig used worldwide for shot holes and mineral exploration. Allows recovery of wet or dry samples or cores.

PHOTO AT RIGHT—shows Failing 1500 Holemaster Rig, a compact, mobile, all-purpose drilling unit for taking cores, deep shot holes or shallow production.

GEORGE E. FAILING COMPANY ®

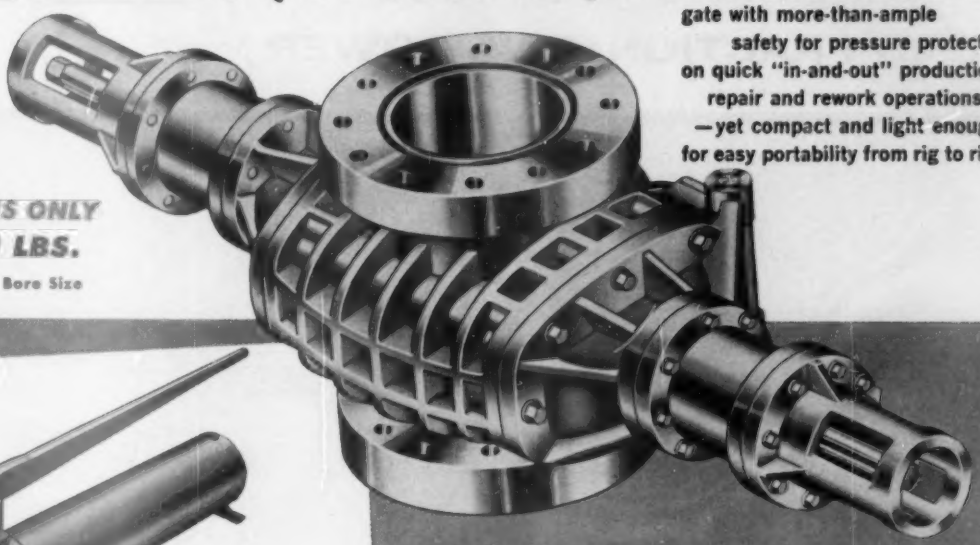
GEORGE E. Failing COMPANY

A SUBSIDIARY OF
WESTINGHOUSE AIR BRAKE COMPANY
ENID, OKLAHOMA, U.S.A.

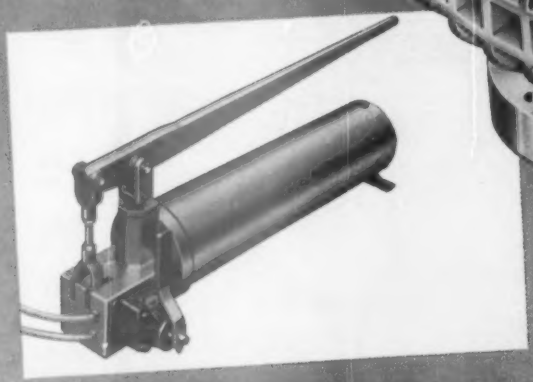
Now you CAN take it with you!

THE SHAFFER TYPE LWS Blowout Preventer!

Here is one of the year's most important advancements in well pressure control, a hydraulic gate with more-than-ample safety for pressure protection on quick "in-and-out" production, repair and rework operations —yet compact and light enough for easy portability from rig to rig.



WEIGHS ONLY 780 LBS. in 7 1/16" Bore Size



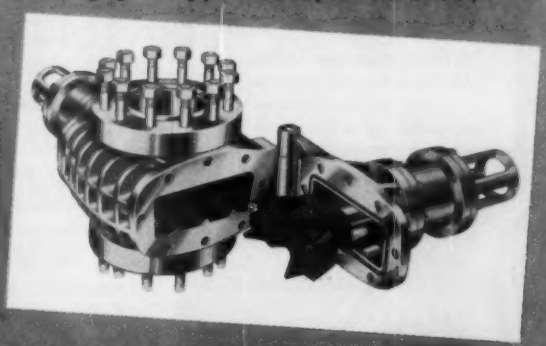
HAND PUMP OPERATION

To further speed up installation and break-out operations, you don't need a power-driven hydraulic system to operate the Type LWS. You can use one, of course, and various power driven systems are available for closing the Type LWS in from 2 to 7 seconds, depending upon the arrangement used.

But where installation simplicity is the keynote, a portable Shaffer Hand Pump is available—completely self-contained with its own hydraulic reservoir. *It can be mounted wherever convenient and will close Type LWS rams in from 15 to 20 seconds—fast enough for even urgent pressure emergencies!*

EASY RAM ACCESSIBILITY

You'll also like the "Swinging *End*-Opening" design that permits you to change rams or service the ram compartment *without breaking hydraulic connections or losing operating fluid.* (*See open view below.*)



Other Type LWS advantages include positive **"In-Line" Piston and Ram Design,** with no yokes, levers or complicated connections between each ram and its operating piston... **Quick-Draining Ram Compartments** with rams traveling on guide ribs high above any sand or mud accumulations...: and still other pressure control advancements developed by Shaffer, the industry's leader in well pressure control equipment.

37 years OF OIL TOOL LEADERSHIP

SHAFFER

HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

CALIFORNIA SERVICE SHOPS: Santa Fe Springs, Santa Maria, Ventura Avenue, Bakersfield and Taft.
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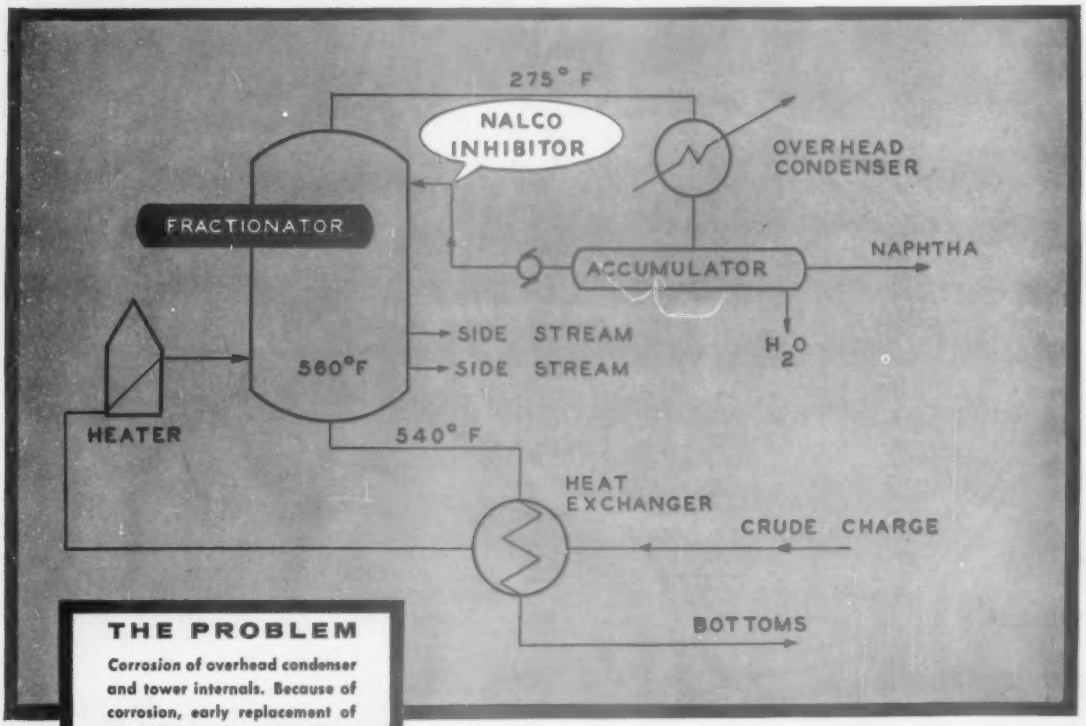
OKLAHOMA CITY, OKLAHOMA, Shaffer Tool Works, 6201 South Shields Boulevard
FARMINGTON, NEW MEXICO, Shaffer Tool Works, Post Office Box 546
CASPER, WYOMING, Shaffer Tool Works, Post Office Box 1788
HOUMA, LOUISIANA, Shaffer Tool Works, Post Office Box 827
EXPORT SALES OFFICE: Shaffer Tool Works, 500 Fifth Avenue, New York, N.Y., U.S.A.
IN CANADA: Shaffer Western Hemisphere, Inc., 5823 103A Street, Edmonton, Alberta.

WANT MORE FACTS?

This 12 page bulletin illustrates and explains the unique Type LWS advantages. Write or phone your nearest Shaffer representative for free copy!

HOW *Nalco* INHIBITORS CUT DOWNTIME 74% ...AND SAVED THIS FRACTIONATING TOWER



THE PROBLEM

Corrosion of overhead condenser and tower internals. Because of corrosion, early replacement of the tower was contemplated.

THE TREATMENT

Nalco Corrosion and Fouling Inhibitor applied into overhead reflux.

THE RESULT

In this case only one point of application protected both fractionator and overhead equipment. Iron in accumulator water brought below 0.5 ppm as compared to previous 100-150 ppm. Corrosion and plugging stopped, tower saved, and downtime for cleaning reduced by 74%.

EFFECTIVE Nalco corrosion control is very low-cost protection. For example, this refinery not only avoided the cost of a new tower, but cleaner tower internals actually resulted in better fractionation and higher quality products. If you would like further facts on Nalco Corrosion and Fouling Inhibitors, ask your Nalco Representative or write direct.

National Aluminate Corporation is now

NALCO CHEMICAL COMPANY

6242 West 66th Place • Chicago 38, Illinois

Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany

In Canada—Alchem Limited, Burlington, Ontario

THE *Nalco*® SYSTEM ...SERVING INDUSTRY THROUGH PRACTICAL APPLIED SCIENCE

Nalco CHEMICALS

MR-20 MOTOROLA MICROWAVE

for unequalled "on the job" performance

Motorola's *experience* in microwave design, manufacture and installation guarantees full communications satisfaction where it counts—on the job. Outstanding operational flexibility, long-life service and all-weather dependability, are service proved facts in public safety, industrial and utility applications throughout the country.

Simple "building-block" components—MR-20 RF units and associated multiplex equipment—are fitted to your exact required combination of voice, printed message, control signals and data transmission—including 2-way radio operation. Multi-channel, point-to-point operation spans any distance . . . carries your messages at low per-mile operating and maintenance costs.

What are just-right communications worth to your operations? It's easy to find out. Have your Motorola microwave representative show you on-the-job examples of full-efficiency microwave performance. Write or call today for details.

MOTOROLA ADVANCED DESIGN MAKES THE BIG DIFFERENCE

- **Automatic switchover-switchback**
- **"Hot" standby**
- **Simplified Waveguide**
- **Plus outstanding Motorola 6000 MC operational developments for optimum system performance.**

MOTOROLA *MICROWAVE*

Motorola Communications & Electronics, Inc., 4501 Augusta Boulevard, Chicago 51, Illinois • A Subsidiary of Motorola Inc.

Engineering Progress Report

FROM UNION CARBIDE CHEMICALS COMPANY

Ethylene Glycol Scores High As Hydrate Inhibitor

In refrigeration-type gasoline recovery plants, the most widely used hydrate point depressant is diethylene glycol. But, ethylene glycol may offer certain advantages as a replacement in your plant, for example . . .

SELECTION GUIDE

ADVANTAGE	Ethylene Glycol	Diethylene Glycol
Hydrate Inhibition	GOOD	GOOD
Ease of Separation	BETTER	GOOD
Cost	LOWER	—
Vaporization Loss	LOW	LOWER
Solubility Loss	LOWER	LOW

HYDRATE INHIBITION

While both ethylene and diethylene glycol give good hydrate inhibition, with hydrate point depressions generally in the range of 60° to 80°F., reports indicate that ethylene glycol may give a greater depression in those cases needing very low separation temperatures.

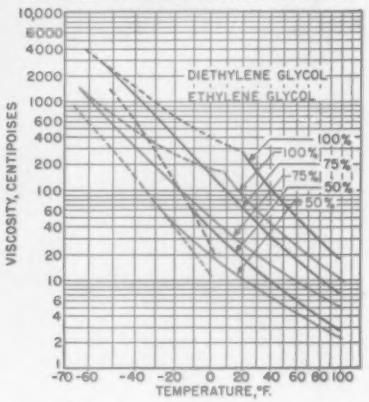
EASE OF SEPARATION

Ethylene glycol-water solutions are easier to separate at very low temperatures than diethylene glycol-water solutions.

This advantage is illustrated in the graph below. At 0°F. the viscosity of a 50 per cent ethylene glycol solution is 20 centipoises, or half the viscosity of the diethylene glycol solution.

An even more marked difference is shown at lower temperatures . . . at—40°C. a 75 per cent ethylene glycol solution has a 300 centipoises viscosity, as compared with 1000 to 2000 for a 75 per cent diethylene glycol solution.

VISCOSITY OF GLYCOL-WATER MIXTURES



COST

Ethylene glycol costs 1¾¢ a pound less than diethylene glycol which means a possible tank car savings of $1,300.

VAPORIZATION

Although ethylene glycol vaporization losses are greater than diethylene glycol's, the difference is insignificant below 30°F., if separator pressure is 750 PSI or higher.

SOLUBILITY

At separation temperatures of 60°F., glycol losses due to solubility should be in the range of 10 to 50 ppm when 50 to 75 per cent ethylene glycol solutions are used; and 20 to 100 ppm with equal strength diethylene glycol.

The higher volatility of ethylene glycol must be taken into consideration in regeneration equipment design and operation; but ethylene glycol may offer advantages in certain systems. Your CARBIDE Technical Representative can show you data on the pros and cons of ethylene or diethylene glycol hydrate inhibition in your system.

For a copy of a new report, "The Glycols as Hydrate Point Depressants in Natural Gas Systems" and a comprehensive bibliography of all the major articles published on gas sweetening and dehydration in the last 25 years, use the coupon.

UNION CARBIDE *is a registered trade mark of Union Carbide Corporation.*

UNION CARBIDE CHEMICALS COMPANY, Rm. 328, Dept. G, 30 E. 42nd St. New York 17, N.Y.

Please Send Me

- ☐ Technical data report—"The Glycols as Hydrate Point Depressants in Natural Gas Systems."
- ☐ 15-page Gas Sweetening Bibliography.
- ☐ Please have a CARBIDE Technical Representative call.

NAME: ..... POSITION: .....

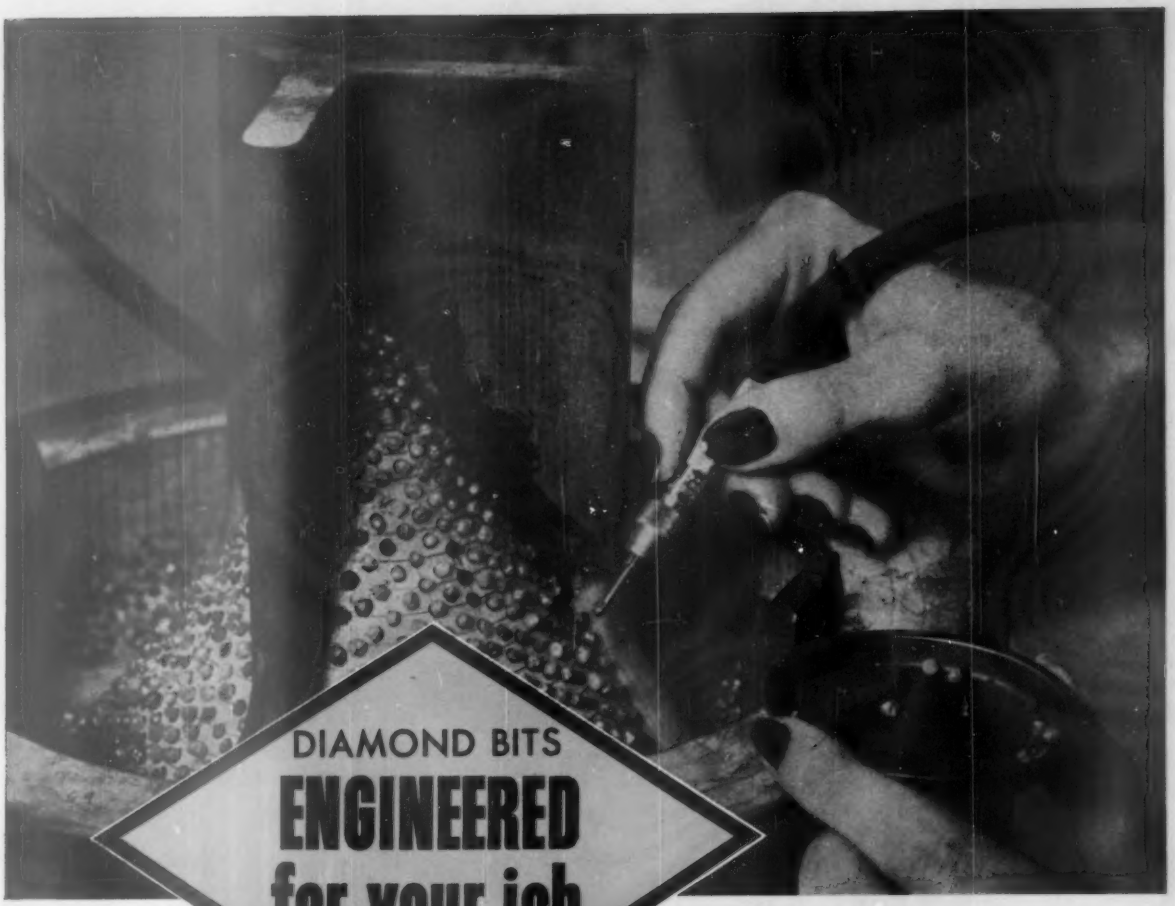
COMPANY: .....

ADDRESS: .....

CITY: ..... STATE: .....

UNION CARBIDE CHEMICALS COMPANY

DIVISION OF UNION CARBIDE CORPORATION



DIAMOND BITS

ENGINEERED for your job

mean

"Less Cost Per Foot"

And to assure you of "less cost per foot" drilling, Christensen engineers each bit to meet a specific drilling requirement. The waterways, matrix and style are designed for correct diamond placement, concentration and size. The diamonds are carefully sorted into proper sizes and graded to assure uniform quality. Then they are hand set by Christensen's staff of experienced technicians to be sure that the best cutting side of the diamonds works for you. The proper diamond exposure is determined by the formation in which the bit will be used. This combination of Christensen custom engineering and smooth cutting diamonds means top performance for you regardless of hole size, circulating medium or type of formation.

Diamonds Mean, "Less cost per foot."

CHRISTENSEN DIAMOND PRODUCTS

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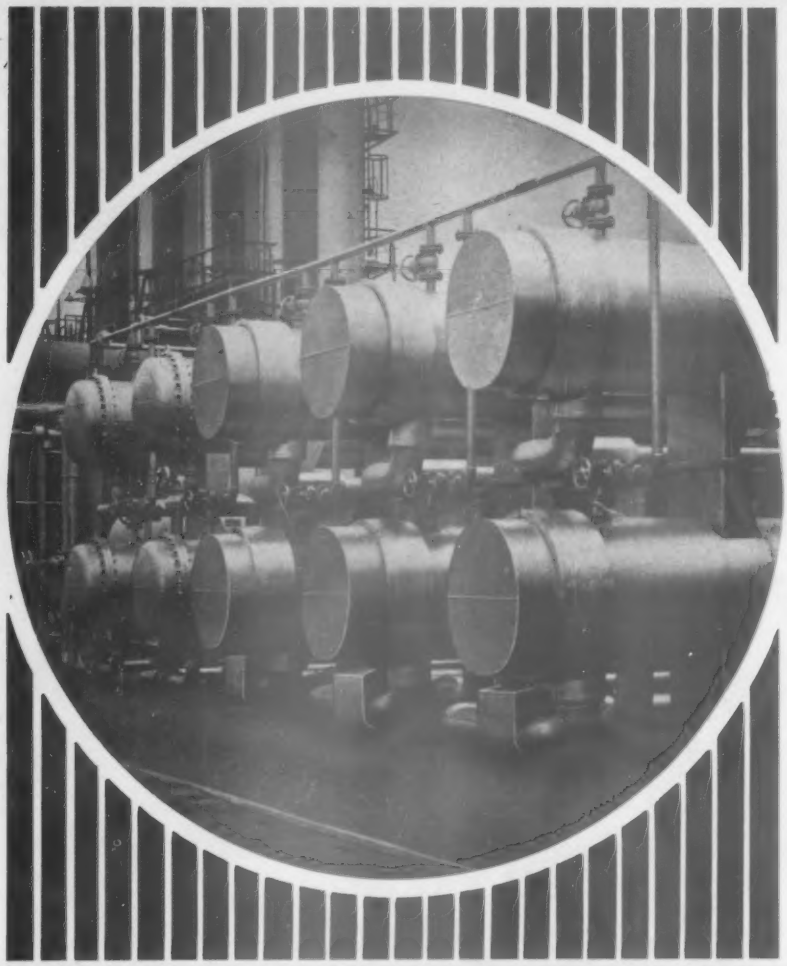
P. O. BOX 387 SALT LAKE CITY, UTAH

To obtain faster penetration, straighter holes, fewer round trips and better diamond usage, call the Christensen representative nearest you for additional information about diamond bits and core barrels engineered for your job.



HEAT EXCHANGERS by CHIYODA

The newest time-saving methods plus the highest standards of fabrication result in dividend-paying equipment that is characterized by its precise, efficient operation and long life. Heat exchangers, coolers, condensers, and other process equipment, standard or special, large or small, single or by the scores, are fabricated at CHIYODA's new Kawasaki Factory with the most modern fabricating and testing equipment, using fabrication methods backed by years of experience. With an integrated organization staffed by specialists in every field plus lower man-hour costs, CHIYODA assures clients of early delivery, low maintenance cost, high operating efficiency and long life. For your process equipment requirements anywhere in the world . . . . . Contact CHIYODA.

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CHEMICAL ENGINEERING & CONSTRUCTION CO., LTD.

PRESIDENT A. TAMAKI
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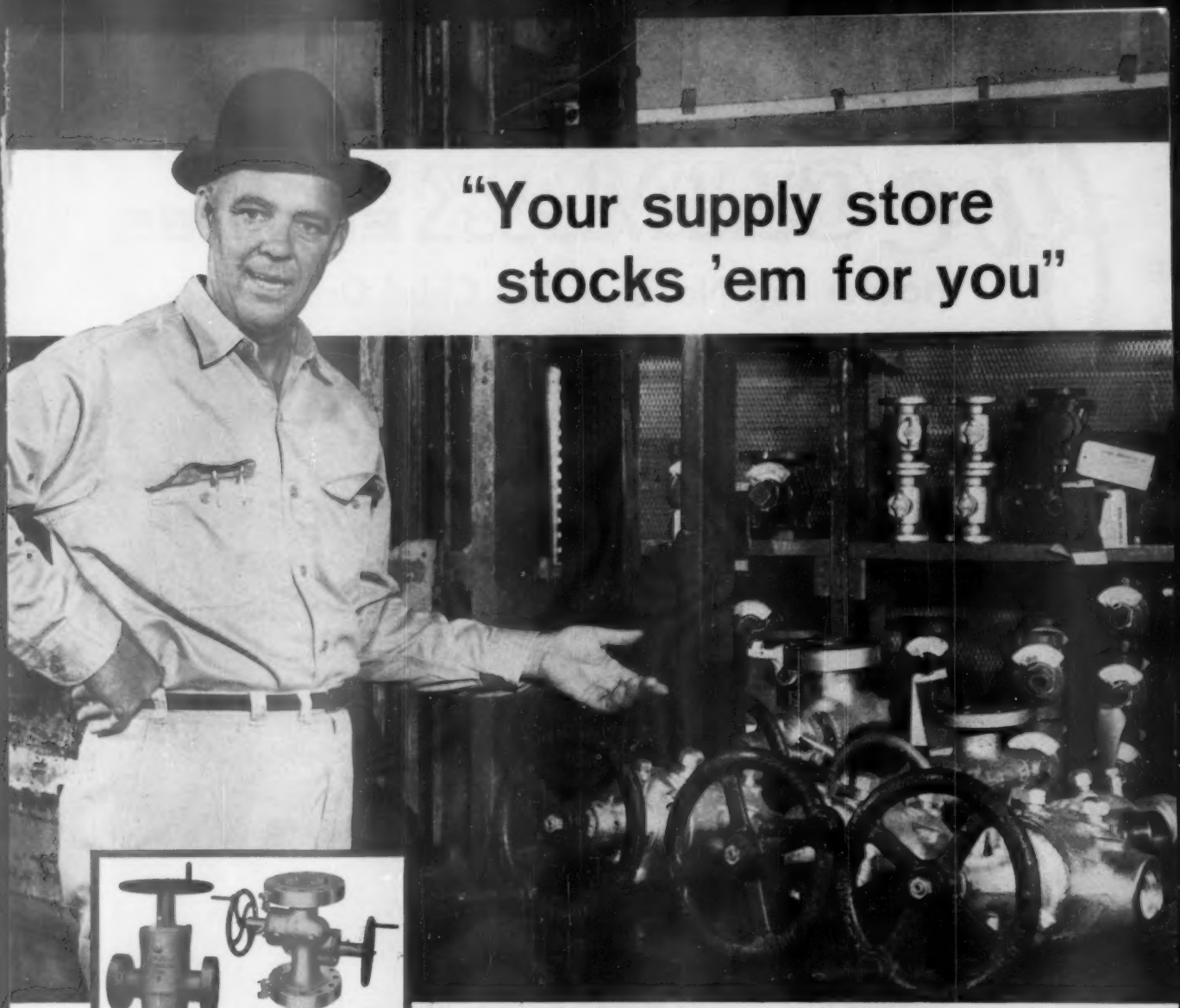
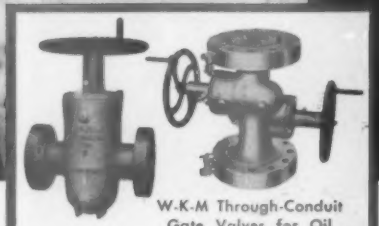
"Your supply store stocks 'em for you"

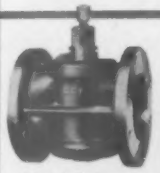




W-K-M Through-Conduit Gate Valves for Oil Field Service Catalog 200

W-K-M Through-Conduit Gate Valves (ASA) Catalog 300

W-K-M's Pressure Sealing Gate Valves (ASA) Catalog 1200



ACF Lubricated Plug Valves (Semi-Steel) Catalog 400 (Steel) Catalog 1100

ACF Non-lubricated Ball Valves Catalog 1000

W-K-M® and ACF® Valves

Whatever your valve requirements, your nearby oil field supplier can fill them. He stocks all standard models and sizes of W-K-M and ACF valves for production, pipeline and general service. He can obtain W-K-M technical assistance and expedite special orders for you.

Next time — and every time — you need valves, order W-K-M and ACF from your supply store. You'll get the best performance you've ever had.

PRODUCTS OF W-K-M's *Creative Engineering*

WRITE FOR CATALOGS LISTED

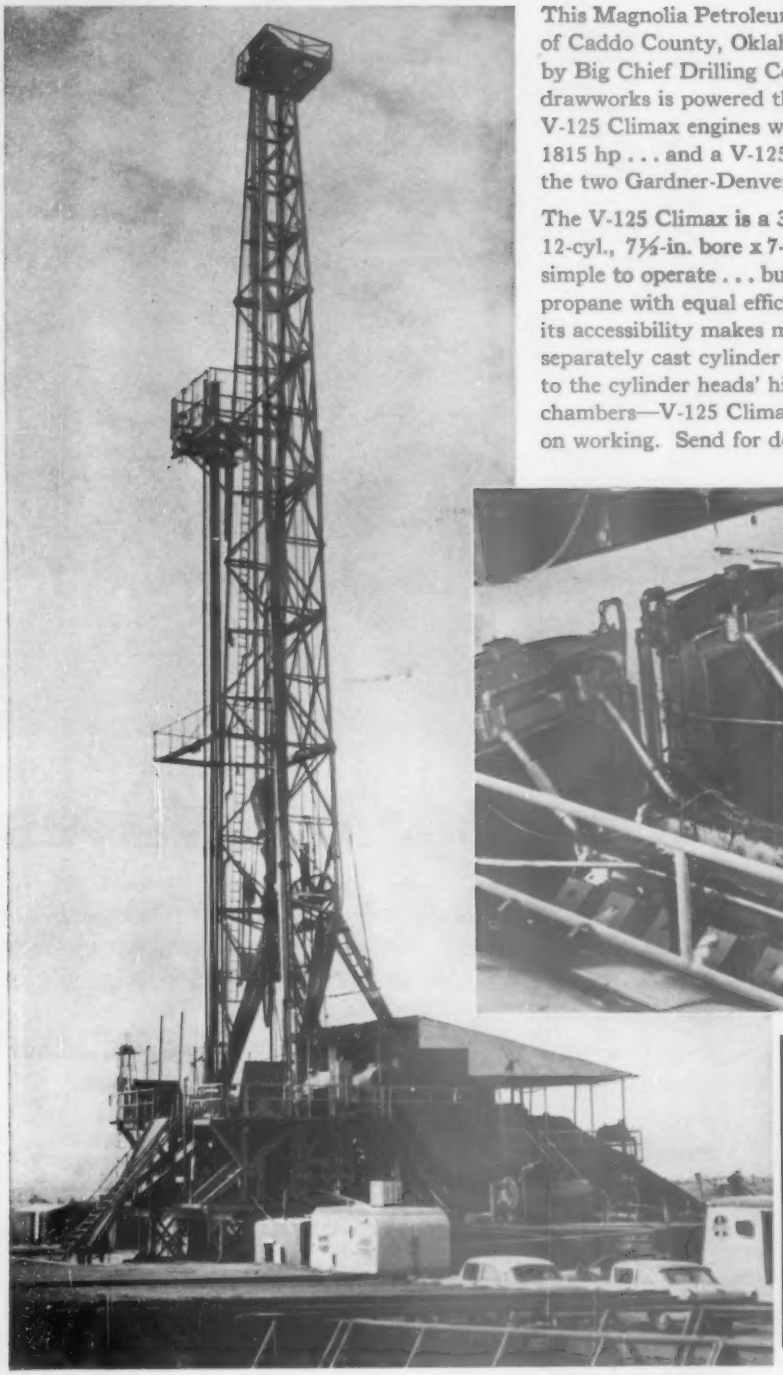
W-K-M

DIVISION OF ACF INDUSTRIES INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

5915 R

five CLIMAX V-125 ENGINES

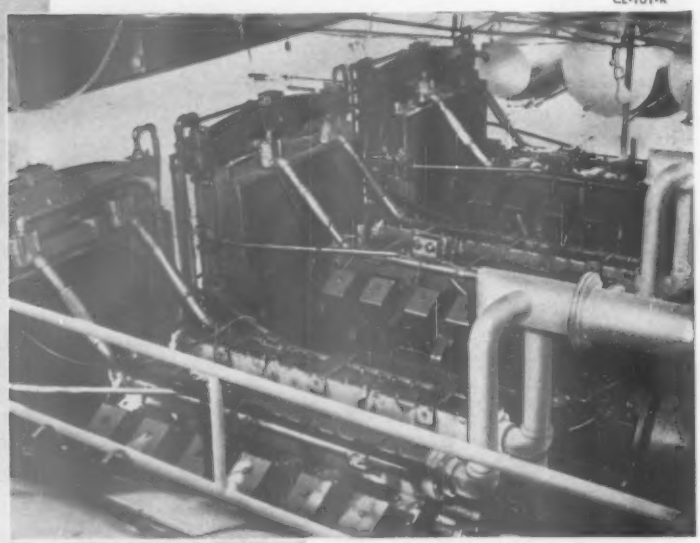
power Rig No. 2 of Big Chief Drilling Co.



This Magnolia Petroleum Co. well in the old Cement Field of Caddo County, Oklahoma, was drilled to 20,426 ft. by Big Chief Drilling Co. Rig No. 2. The rig's National drawworks is powered through a compound by three V-125 Climax engines with a combined maximum of 1815 hp . . . and a V-125 Climax engine powers each of the two Gardner-Denver PL-7 mud pumps.

The V-125 Climax is a 3711 cu. in. engine—V-type, 12-cyl., 7½-in. bore x 7-in. stroke—easy to start . . . simple to operate . . . burns natural gas, butane, or propane with equal efficiency, and great economy . . . and its accessibility makes maintenance easy. From its separately cast cylinder blocks with their renewable sleeves to the cylinder heads' high turbulence combustion chambers—V-125 Climax is built for its work and it keeps on working. Send for descriptive bulletin.

CL-101-R



CLIMAX ENGINE MANUFACTURING CO.
Factory—Clinton, Iowa
DIVISION OF WAUKESHA MOTOR COMPANY

MR. JAKE L. HAMON

President, Hamon Oil Company
Past Chairman of the Board
American Petroleum Institute, 1956-1957

"Valued Partners . . ."

"My business is drilling for oil and gas. If the wells are successful, I must produce them efficiently and economically.

"I consult the service and supply men whenever drilling is started in a new territory. They quickly give me the correct information on the area, because they know the operating problems. This saves me valuable time and provides for a planned drilling program.

"We are continually faced with the problem of drilling and completing deeper and deeper wells. The research departments of the Equipment and Service Industries have developed new and better materials to get this job done. Without the improved equipment we would really be up the creek. The Supply Stores stock needed materials, eliminating burdensome and costly inventories for the operator.

"With the cooperation of the manufacturers, the American Petroleum Institute has done a great job in its standardization activities. Their men have served the committees faithfully, giving unselfishly of their time and knowledge. Because their plants and offices, in many cases, are located outside oil and gas producing states, they have assisted us in defending the depletion provision in those areas.

"Manufacturing, service and supply companies are valued partners to me. They are always 'Johnny-on-the-spot' with equipment, supplies and know-how, when and where it is needed. These companies are made up of loyal, determined, aggressive men who, through their dedication and willingness to sacrifice, are 'oil men' in the truest sense of the word."

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

PROUD TO BE PART OF A PIONEERING INDUSTRY

ORDINARY CHAIN BREAKS when the side plate tires from repetitive loading and unloading during the cycle around the sprockets. But Morse H-E Roller Chain has a 95% higher endurance limit and outlasts ordinary chain by up to 5 to 1.

"Tired Metal"... the bane of chain now licked by MORSE H-E

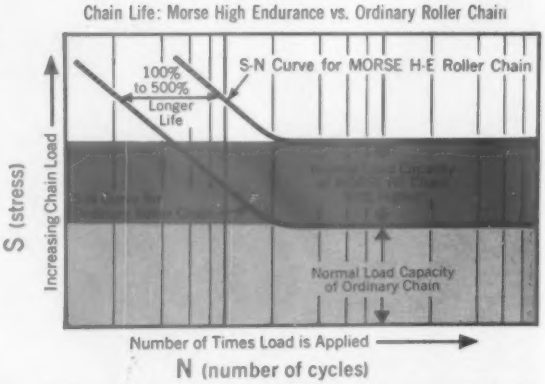
Morse H-E Roller Chain outlasts ordinary chain by up to 5 to 1... can save you thousands of dollars annually on tough drilling jobs

Deep drilling puts chain under terrific loads and shocks until metal "tires," and ordinary chain breaks. But a special process gives Morse H-E Roller Chain 95% higher endurance limit . . . up to 500% longer service life.

This special process means Morse H-E Chain costs up to 10% more. Yet that's a small price to pay for heavy-duty oil-rig chain that can save you thousands of dollars yearly in replacement costs and downtime.

For more information on the chain that licked the "tired metal" problem, check your favorite supply store. Or write: MORSE CHAIN COMPANY, Dept. 22-40, Ithaca, New York. Warehouses in Casper, Wyoming; Houston and Odessa, Texas; Farmington and Hobbs, New Mexico. Export: Borg-Warner International, Chicago 3, Ill.

Chain Life: Morse High Endurance vs. Ordinary Roller Chain

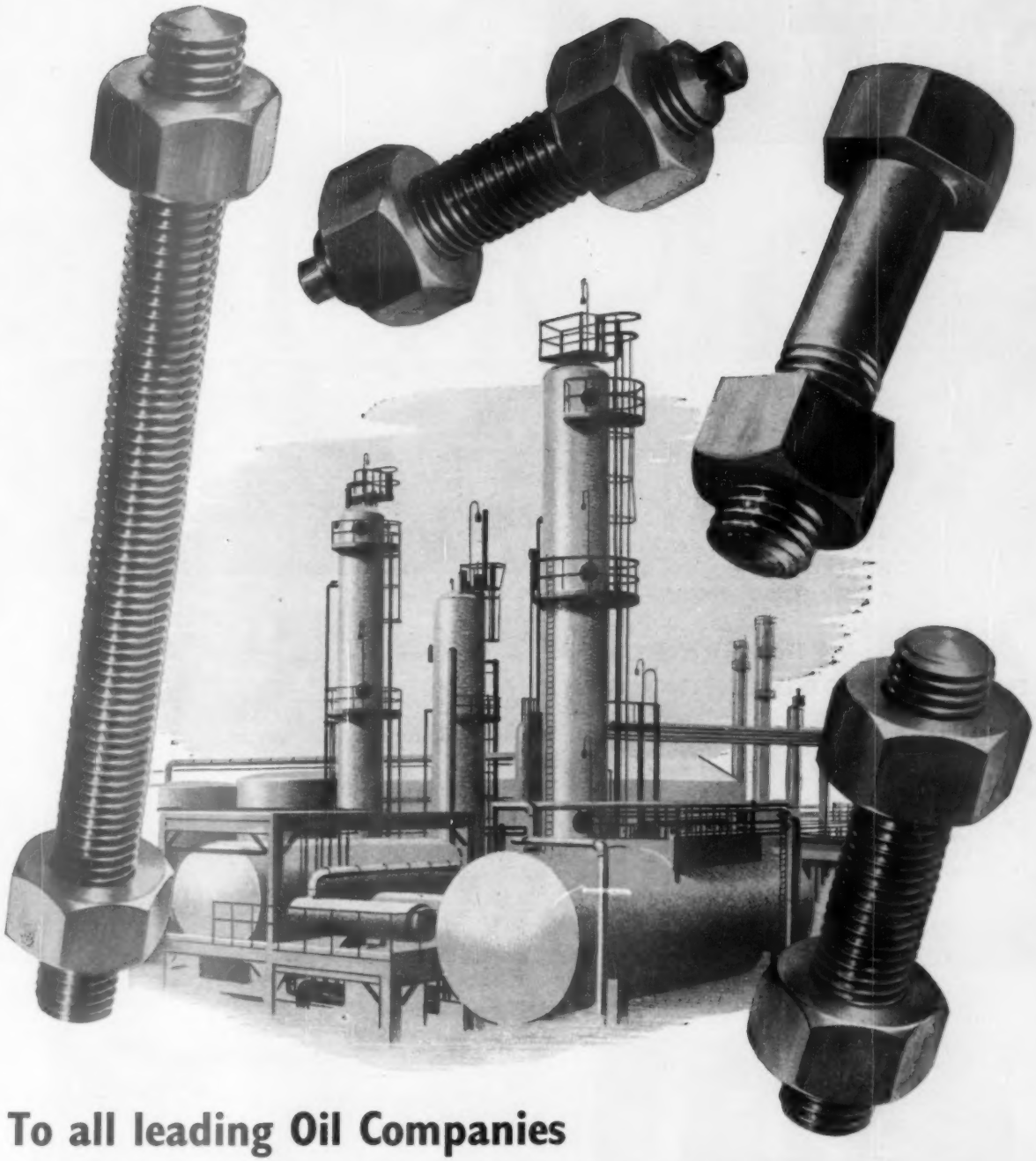

100% to 500% Longer Life
S-N Curve for MORSE H-E Roller Chain
Normal Load Capacity of Ordinary Chain
S (stress)
Increasing Chain Load
Number of Times Load is Applied
N (number of cycles)

Red area: Under these chain loads, fatigue will break ordinary chain . . . but not Morse H-E.

White area: Under these loads, fatigue will break ordinary chain and Morse H-E . . . but Morse H-E will have operated 100% to 500% longer.

MORSE BW

A BORG-WARNER INDUSTRY



To all leading Oil Companies

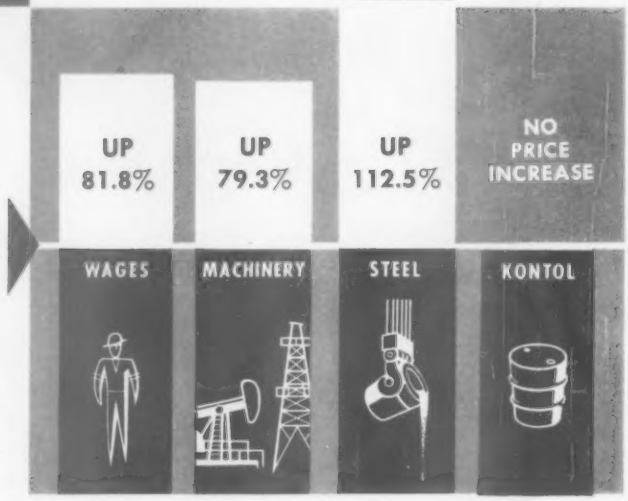
GKN supply bolting material to refineries all over the world. This includes Alloy Steel Stud Bolts, Carbon Steel Stud Bolts, Alloy Steel Studs and Carbon Steel Studs, and Carbon Steel Bolts and Nuts to specifications laid down in BS.1750 and BS.1506.

if it's a matter of how to fasten one thing to another . . .
get in touch with **GKN**

GUEST KEEN & NETTLEFOLDS (MIDLANDS) LTD. BOLT AND NUT DIVISION: ATLAS WORKS, DARLASTON, S. STAFFS, ENGLAND

o/17.a/767

another
TRETOLITE SERVICE
report



IN A PERIOD OF RISING PRODUCTION COSTS

KONTOL *prices are still at 1948 level!*

The Tretolite research staff constantly seeks ways to produce better KONTOL* Corrosion Inhibitor formulas for less money. This concern for *cost control* as well as *corrosion control* has kept the per gallon price of KONTOL at the 1948 level! Today, when costs of equipment, material, and wages are spiraling higher, it makes more sense than ever before to invest in a sound KONTOL corrosion control program.

Ask the Man in the Red Car how it can be done.

*Registered trademark, Petrolite Corporation

KF-60-3

PETROLITE CORPORATION

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5515 Telegraph Road, Los Angeles 22, California

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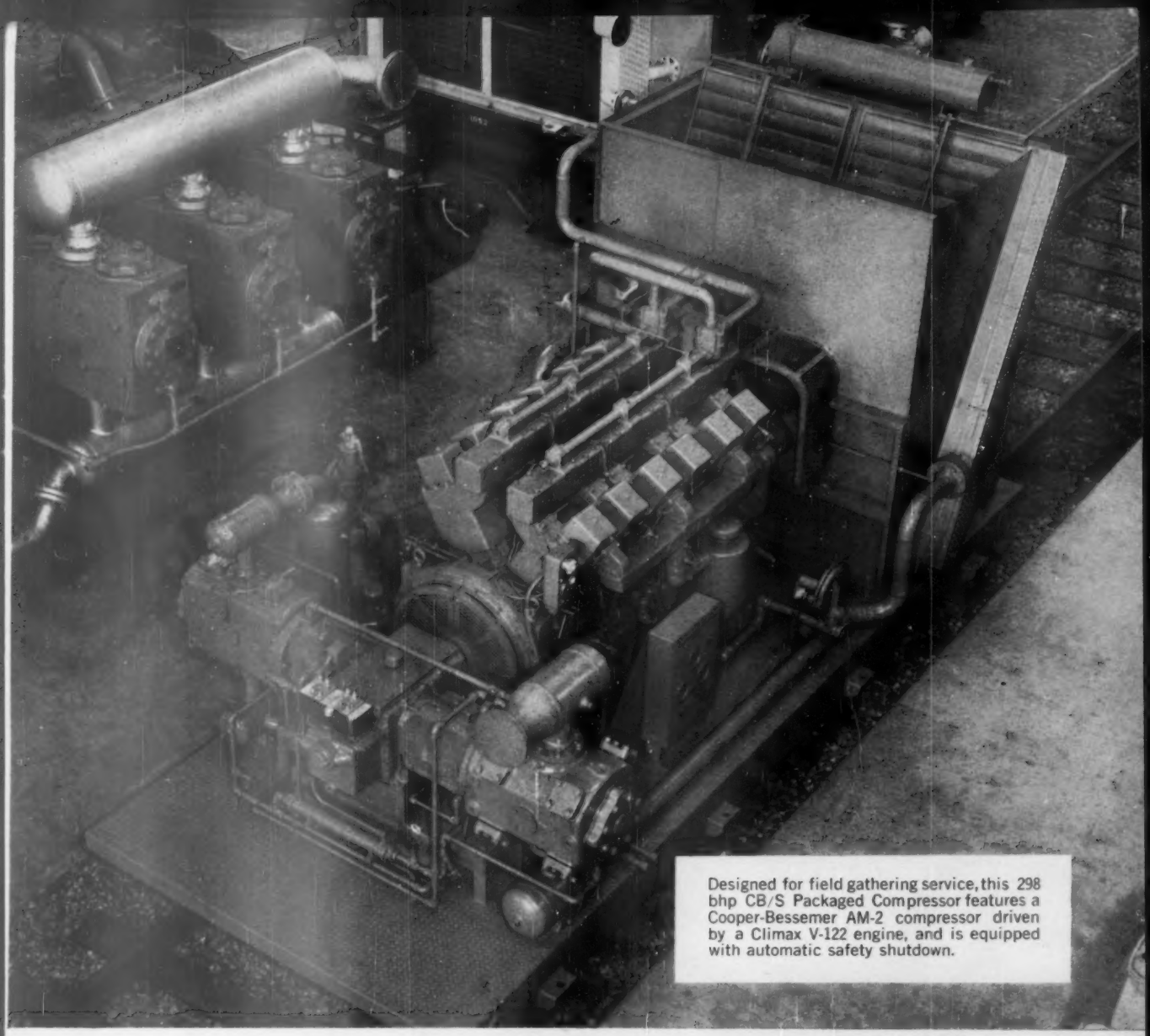
ENGLAND: Petrolite Limited, 20 Savile Row, London W.1
VENEZUELA: South American Petrolite Corporation, Hotel Avila, Caracas

REPRESENTATIVES
BRAZIL: WERCO, Ltda., Avenida Rio Branco 57-s/1410-11, Rio de Janeiro
COLOMBIA: W. F. Faulkner, Calle 19, No. 7-30, Office 807, Bogota
GERMANY: H. Costenoble, Guiollettstrasse 47, Frankfort, a.M.
ITALY: NYMCO S.p.A. 9, Lungotevere A. da Brescia, Rome
JAPAN: Maruwa Bussan KK, No. 3, 2-Chome, Kyobashi, Chuo-Ku, Tokyo
KUWAIT: F. N. Dahdah, Box 1713, Al Kuwait
MEXICO: R. E. Power, Sierra de Mijes, No. 125, Mexico, D. F.
NETHERLANDS: F. E. C. Jenkins, Hoefbladlaan 134, The Hague
PERU: Oilfield Import, S. A., Apartado 71, Talara
TRINIDAD: Neal and Massy, Ltd., P.O. Box 544, Port of Spain



Designed for field gathering service, this 298 bhp CB/S Packaged Compressor features a Cooper-Bessemer AM-2 compressor driven by a Climax V-122 engine, and is equipped with automatic safety shutdown.

Building packaged compressors is our business . . . our only business. This single objective is the reason CB/S Packaged Compressors are more advanced in design . . . more efficient in the field.

CB/S
PACKAGED
COMPRESSORS

CB/S

C-B SOUTHERN, INC., P. O. BOX 19267, HOUSTON 24, TEXAS

A subsidiary of The Cooper-Bessemer Corporation.

Two experienced producers get their heads together. Research and progress are reflected in Cabot performance. More and more leading producers use these units because of Cabot's dependability. Cabot units are available with API gear box ratings of 6,400 to 456,000 inch-pounds. Cabot offers a complete line of beam balanced, crank balanced and air balanced units.

How Leading

Production Men Cut Costs

Leading production men select quality equipment for long life and low maintenance. They rightly reason that extra performance and dependable service add up to real economy.

Time proven, blue chip equipment sold by J&L Supply yields dividends for production men who use performance as a yardstick for measuring costs.

Your J&L man has up-to-date literature for your reference on our complete line of quality production equipment.

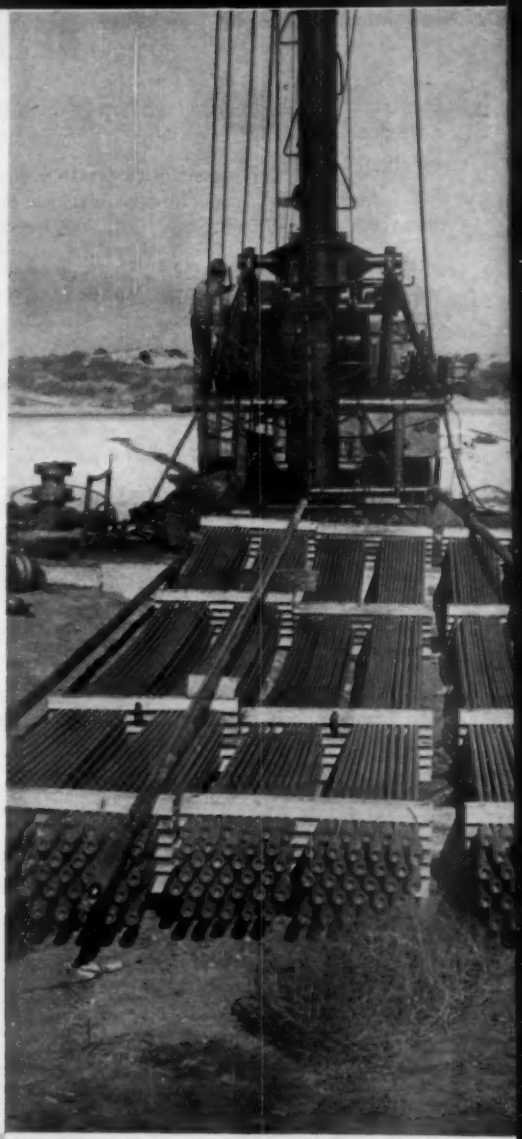
Invest in quality — and save. Call your J&L Supply man today.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

If it's sold by J&L....
It's the best available

109



Axelson gives you dependable rod strings and bottom hole pumps designed for varied depths and working conditions. Axelson pumps are tailor-made for problem production such as stripper wells, high volume requirements, sand conditions or corrosive agents. J&L pump shops back up Axelson quality with fast dependable service.

A complete line of Jones & Laughlin casing and tubing is available for your production requirements. Special designs are available in addition to regular API products. J&L Extreme Line* casing, Buttress Thread casing and Grayloc tubing are good examples of our special purpose products. Literature on J&L tubular goods is available today from your local J&L man.

*Manufactured under license from The National Supply Co.

COMPLETED AS A PRODUCER . . .
BELOW 20,000 FEET

Had this well been dry, it would merely be another statistic. Yet, it was completed as a producer.

To prove production possibilities on this deep Louisiana well, five Drill Stem Tests were run below the 20,000 ft. mark. In each instance, the packers were set below 20,000 feet, making these the deepest Drill Stem Tests ever recorded.

Testing conditions were most severe. Throughout each test, bottom hole temperature was 426°, mud weight ranged from 18.2 to 18.4, with a viscosity varying from 50 to 60. During the five deep tests, Johnston equipment encountered and recorded formation pressures as high as 19,365 psi and hydrostatic mud pressures up to 22,045 psi.

Packers and other equipment have previously been run and set below this depth; however, none in a Drill Stem Testing operation, nor under the conditions encountered in this well.

No misruns or equipment failures occurred. All equipment was retrieved intact. On two tests, equipment remained in the hole over twenty hours. Tests were performed in 7 inch—35 lb. casing through a 3/8 inch bottom hole choke. All were successful.

Drilling a well below 20,000 feet is a significant accomplishment, especially with the subsurface conditions peculiar to the Gulf Coast. The five Johnston Tests performed at this depth are also significant. They are testimony to the fact that Johnston can conduct Drill Stem Testing operations at extreme depths where high bottom-hole temperatures and extreme high pressures are encountered.

The drilling, testing and completion of this well is a prime example of the value of experience and planning, and proves the advisability of gathering all available information and data for evaluation prior to completing any well.

In any area . . . in any well . . . deep or shallow . . . high pressure or low pressure . . . before you set casing on your next well, call Johnston Testers. You get more from a Johnston test.

All tests were performed by Johnston Testers using the new Johnston testing tools.

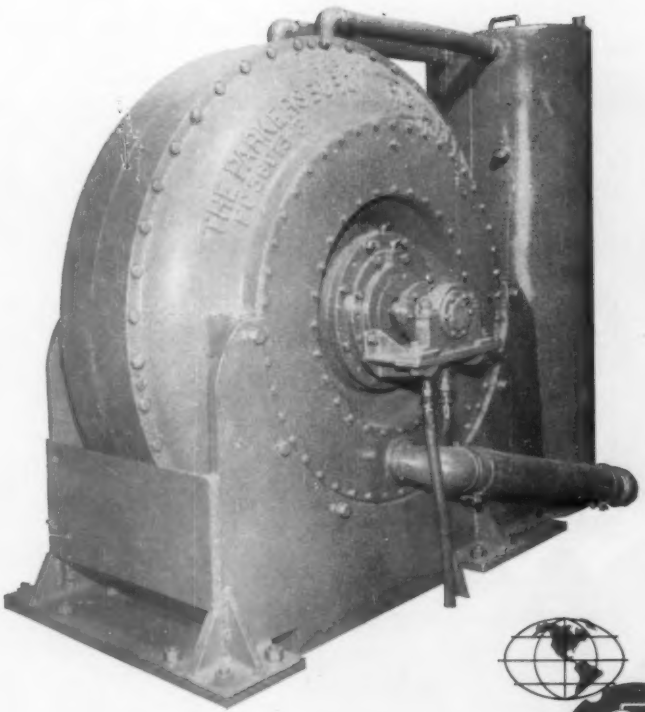
FINAL TEST
Packer set at 20,068'
Initial Hyd. Mud 19,960 psi
Initial Flow 15,435 psi
Final Flow 17,719 psi
Final Hyd. Mud 20,061 psi
Recovery Oil (39.5° Gravity) and Gas

JOHNSTON TESTERS, INC.

P. O. Box 98 Houston 1, Texas

saves more than it costs!

PARKERSBURG HYDROMATIC BRAKE



The Parkersburg Hydromatic Brake has only one moving part . . . the rotor. Only bearings and packing are subject to wear and replacement. And by speeding up your connection and round-trip time, the Hydromatic Brake saves costly drilling time and money. Reduces regular brake maintenance costs, too, as well as wear and tear on your wire lines and other drilling equipment.

Since 1931, Hydromatic Brakes have been specified as standard equipment by major drawworks manufacturers. Whatever your drilling depth, 2,000 feet or 25,000, equip your rig with a Parkersburg Hydromatic Brake. You'll save time — and money.

THE PARKERSBURG RIG & REEL COMPANY
Division of Parkersburg-Aetna Corp.
PARKERSBURG • HOUSTON • COFFEYVILLE

Pittsburgh Seamless Helps Texas Driller Solve Cost Squeeze In Grapefruit Grove

Texkan Oil Company Has 'Never Run Into Defects With Pittsburgh Casing,' Relies on Independent Distributor for Fast, Reliable Service

Any time you go probing for gas where grapefruit grow, tree damage and higher leasing costs put an extra "squeeze" on drilling budgets.

Authority for this is a fast-moving Dallas independent, Richard M. (Dick) Finder. He owns and heads Texkan Oil Company, a medium-sized producer now drilling in the promising Whitted Field surrounding McAllen, Texas.

Located in the middle of the Lower Rio Grande Valley (in Hidalgo County) the McAllen area is well-irrigated. Thus, its nearly 50,000 trees grow great quantities of the famous Texas pink grapefruit.

Underneath the neat rows of trees, however, are natural gas pools large enough to have made the area well-known among oilmen for the size of its reserves.

But since you can't get to the gas till you've gone through the grapefruit, you have to find a way to offset the $18 to $25 it costs to buy a matured tree.

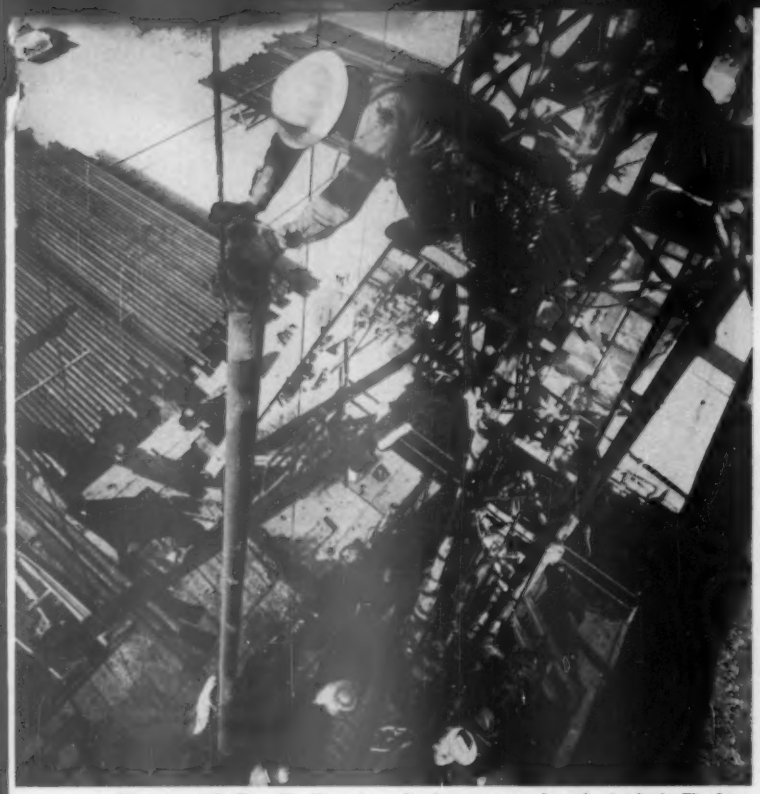
• **Three ways**—Texkan follows three rules to reduce as much as possible the financial risks of exploration and drilling:

• **Texkan uses the latest scientific testing equipment** and procedures whether there's a grapefruit grove involved or not.

• **Texkan buys from independent oil field supply companies,** suppliers who have built their businesses by offering top quality in materials and service. Texkan knows these independents stand behind their sales.

• **Texkan insists on API quality** in the seamless steel products it uses, such as drill pipe, tubing and casing made by Pittsburgh Steel Company, one of the nation's most experienced seamless producers.

Near McAllen, Texas, in the lower Rio Grande Valley, this 129-foot drilling rig stands out in a landscape of a grapefruit grove. The area is a major producer of Texas pink grapefruit. Gas drillers must add tree damage costs to the usual heavy drilling expenses. Mature grapefruit trees are worth from $18 to $25 each.



Pittsburgh Steel's Seamless Casing was used exclusively in Texkan Oil Company's 7,500-foot well in Hidalgo County, Tex. Here, roughneck positions casing from monkeyboard on 129-foot rig.

Thread protectors must come off before casing goes to drilling platform. Texkan says it has never had defects in Pittsburgh Seamless.

Independent supplier's overnight delivery of casing kept well fully on schedule—vital if drilling costs are to be controlled.

Mr. Finder reasons that the price structure for natural gas leaves little margin to go on. So, he's got to keep drilling and exploration costs at rock-bottom.

As to choice of suppliers, Texkan's size dictates that it must have a flexible and immediate source of steel products. In times of shortages, Texkan has gotten help from the independent suppliers who know they must serve to compete.

On seamless quality, Texkan's Chief Engineer—M.D. Frazier—puts it this way:

"There's no reason for drilling, if you don't have performance from pipe. If you don't have good pipe, you have no well. We've never run into defects with Pittsburgh Steel's Seamless. Casing threads and pitch all check out and Pittsburgh Seamless is this way with consistency."

Thus, when Texkan ran 7,500 feet of casing into its eighth well in the Whitted Field, it was assured pipe to meet the area's unusually high pressure, and the knowledge that it was made by a steel producer and sold by an independent supplier who know their business because they know the oil business.

Texkan owner Richard M. Finder (left) likes the personal service he gets from independent supplier's representative, Paul Evershade.

Distributor Home Offices

Bradford Supply Company
Bradford, Pennsylvania

Buckeye Supply Company
Zanesville, Ohio

C. W. Cotton Supply Company
Tulsa 5, Oklahoma

Franklin Supply Company
Denver 10, Colorado

Houston Oil Field Material Co.
Houston, Texas

Industrial Supply Company
Wichita Falls, Texas

Iverson Supply Company
Tulsa, Oklahoma

Longhorn Supply Co., Inc.
Houston 14, Texas

Lusey Export Corporation
New York 7, New York

Lusey Products Corporation
Tulsa 19, Oklahoma

McJunkin Corporation
Charleston 22, West Virginia

Midland Supply Company
Wichita 7, Kansas

Mountain Iron & Supply Co.
Wichita 2, Kansas

The Producers Supply & Tool Co.
Fort Worth 2, Texas

Production & Refining Equipment Company
Odessa, Texas

Sandy Supply Company
Wooster, Ohio

Southwest Supply Company
Pittsburgh, Pennsylvania

The Straker Supply Company
Box 202, Mt. Pleasant, Michigan

Superior Iron Works & Supply Co.
Shreveport, Louisiana

Tex-Tube, Inc.
Houston 7, Texas

Western Supply Company
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"Most Valuable Guide to Valve Economy Ever Published"

TO OBTAIN IT
. . . write or phone your local Jenkins Distributor. If his supply should be exhausted, please request a copy direct from Jenkins Bros. (Dept. E), writing on your letterhead and giving the name of your Jenkins Distributor.

During the last war, when valves were in short supply, "Prevent Valve Failure Before It Starts" was prepared by Jenkins Bros. as a patriotic service. It has been called "the most valuable guide to valve economy ever published". Continuing requests for this out-of-print book led to a recent decision to reprint it.

This book is not advertising matter, and it contains no catalog data. It is costly to produce and the quantity is limited but plant and building operating and maintenance executives and others who install and maintain valves are more than welcome to a copy. Ask your local Jenkins distributor for it.

THE CONTENTS, and the purpose of this book, are given in the following Foreword; page 1...

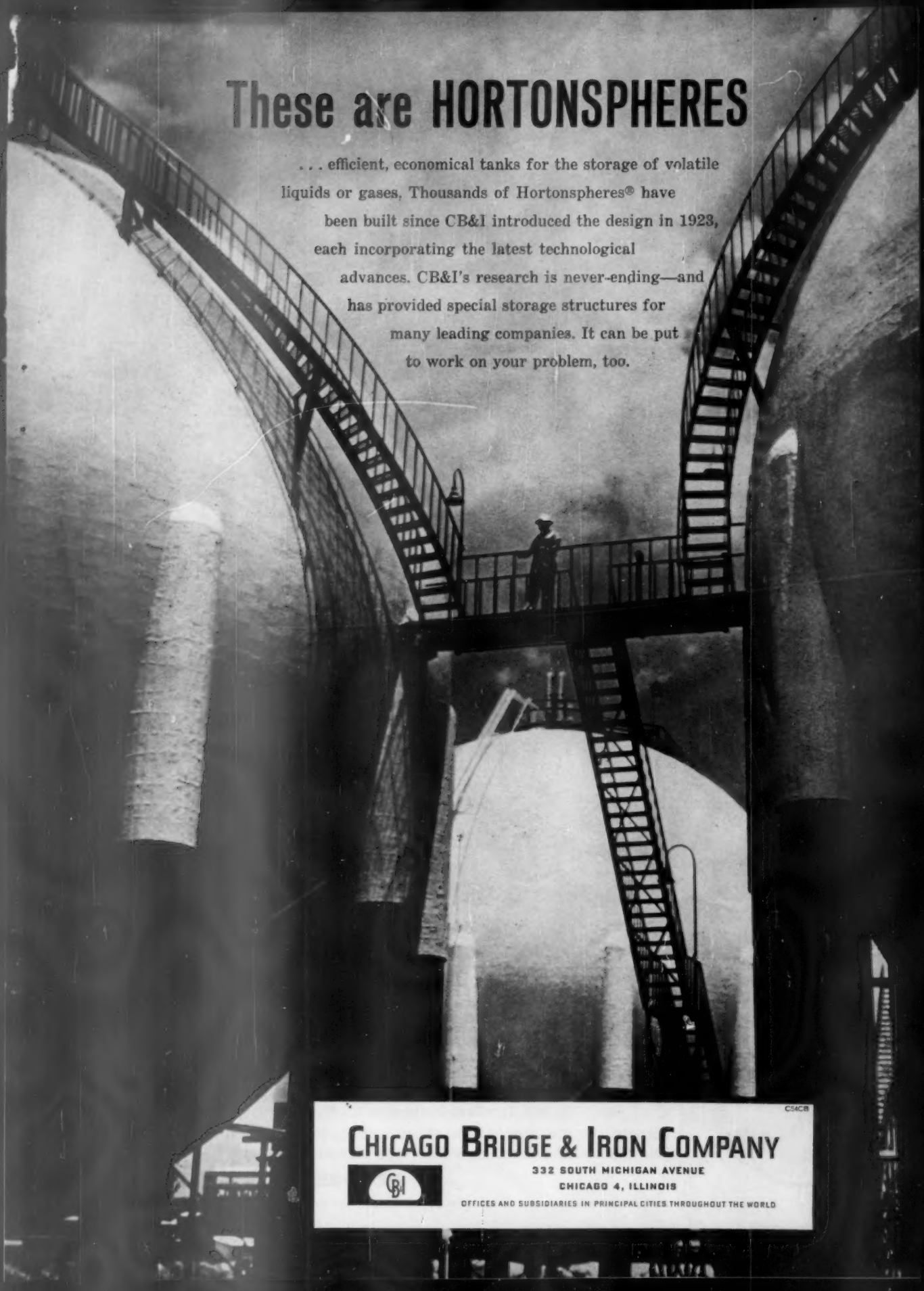
"Valve economy is an objective of good plant management at all times. It is more important than ever today because of the greatly increased costs of valve replacement and maintenance that have paralleled the rise in all expenses of plant operation.

Most valve failure can be prevented before it starts. But to prevent failure, and insure the efficient operation of valves that contributes to plant productivity, four rules must be constantly followed: proper *selection*, correct *installation*, adequate *inspection*, and experienced *maintenance*.

This booklet has been prepared for plant management and supervisors, to explain and illustrate the principal causes of valve failure, how to prevent similar failures, and how to repair damaged valves. In addition to general instructions for installation and maintenance, it includes several examples of actual valve damage and destruction which have been brought to the attention of Jenkins Engineers. In each case the relatively simple precautions that would have prevented such needless waste are clearly explained, in non-technical language."

JENKINS VALVES JENKINS SINCE 1864 Jenkins Bros.

Jenkins Bros., 100 Park Ave., New York 17.


These are HORTONSPHERES
. . . efficient, economical tanks for the storage of volatile liquids or gases. Thousands of Hortonspheres® have been built since CB&I introduced the design in 1923, each incorporating the latest technological advances. CB&I's research is never-ending—and has provided special storage structures for many leading companies. It can be put to work on your problem, too.
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CBI
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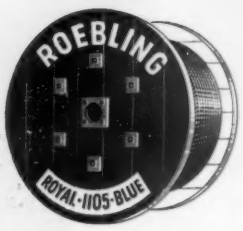
CHICAGO 4, ILLINOIS
OFFICES AND SUBSIDIARIES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

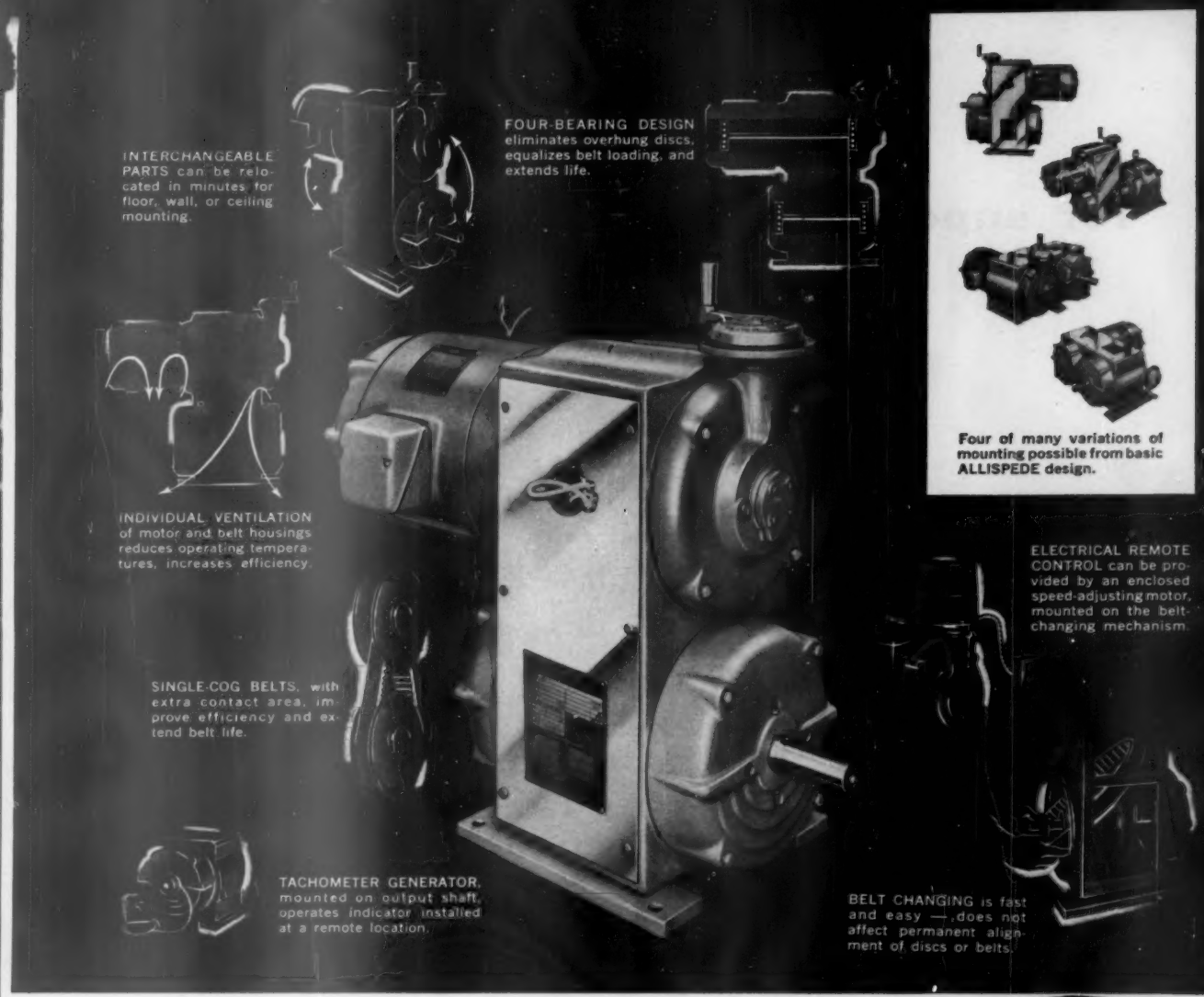
IF THE WIRE ROPE YOU'RE USING HASN'T GOT IT HERE...IT HASN'T GOT IT



This rope has it—and has it at every critical point of wear for these reasons:
Extra Resistance to Bending Fatigue · Extra High Strength
Good Flexibility and Excellent Resistance to · Shock · Abrasion · Impact · Crushing
For anything you want to know about Roebling Royal Blue Wire Rope, ask your Distributor or Roebling's Wire Rope Division, Trenton 2, N. J.

ROEBLING

Branch Offices in Principal Cities *John A. Roebling's Sons Division · The Colorado Fuel and Iron Corporation*


INTERCHANGEABLE PARTS can be relocated in minutes for floor, wall, or ceiling mounting.
FOUR-BEARING DESIGN eliminates overhung discs, equalizes belt loading, and extends life.
Four of many variations of mounting possible from basic ALLISPEDE design.
INDIVIDUAL VENTILATION of motor and belt housings reduces operating temperatures, increases efficiency.
ELECTRICAL REMOTE CONTROL can be provided by an enclosed speed-adjusting motor, mounted on the belt-changing mechanism.
SINGLE-COG BELTS, with extra contact area, improve efficiency and extend belt life.
TACHOMETER GENERATOR, mounted on output shaft, operates indicator installed at a remote location.
BELT CHANGING is fast and easy — does not affect permanent alignment of discs or belts.

Let's look at the features of the ALLISPEDE* Drive

New Louis Allis drive offers accurate control—maximum belt life—long-run economy—low-cost versatility—ease of installation

Here's a drive so easily adaptable to changing physical and operating needs that it obsoletes obsolescence. You can relocate components — add or remove attachments and controls — in the field, in minutes.

Its *all-new* design improves performance and efficiency. Inspection, servicing, and belt-changing are a snap. Furthermore, maintenance is almost nil.

As for versatility — there's an Allispede to meet whatever mechanical drive requirement you have. Sizes up to 30 hp, output speeds from 1 to 10,000 rpm, and speed ranges up to 8:1. Motors can be open, drip-proof, enclosed, or explosion-proof—with ventilated or enclosed belt housings — for foot, P-base, C- or D-flange mounting on your machine.

Allispede is available with parallel shaft, or right-angle, integral speed reducers; special shaft extensions; integral magnetic brakes; electrical or mechanical remote control, and other modifications.

Interested? Contact your nearby Louis Allis District Office or write to The Louis Allis Co., 449 East Stewart Street, Milwaukee 1, Wisconsin, for a copy of Bulletin 3600.

*Allispede is a trademark of The Louis Allis Company.

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MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

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for superior jet fuels...

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THE PROCESS THAT PRODUCES A NEW KIND OF JET FUEL OFFERING BIG AND EXCITING POSSIBILITIES

Jet flight is here to stay. But jet *fuels*, like yesterday's gasolines, will be replaced by better, more improved types . . . the kind made possible by Molex.

A unique, new *continuous* process developed by UOP, Molex removes up to 99% of the normal paraffins in gasoline mixtures, produces a superior jet fuel with these exclusive advantages:

Higher heating value per pound
. . . for greater range or payload.

Lower luminosity
. . . for lower metal temperatures, less carbon deposit, lower overhaul expense.

Less smoke in engine exhaust
. . . for more effective smog control.

High thermal stability
. . . eliminates heat exchanger fouling.

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The consensus of informed opinion is that 1962 will require a substantial increase in process capacity . . . NOW is the time to start your planning! Ask us about a preliminary proposal, no obligation!

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Short-Cycle Units For Hydrocarbon Recovery From Gas Streams At Moderate Pressures

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new analysis shows how to-

cut drilling costs by $200 per day

If you are using mud as heavy as 12 lbs. per gallon, here is an engineering analysis that shows how you can cut mud costs by using a CLAYJECTOR®.

12-pound mud generally contains about 1½ sacks of barite per barrel. Every time you jet a barrel of mud, you lose barite as well as the clays you are trying to get rid of. This means a monetary loss of over $3.50 per barrel.

Now, if you use three steel tanks, you lose about 100 barrels of mud every time you jet down one foot. Since it is common practice with muds in the 12-pound range, to jet at least one foot per day, that means you jet away something like $400.00 worth of barite, oil and chemicals. With heavier muds, there will probably be less jetting. However, the greater amount of barite and chemicals per barrel means an even greater loss by jetting. You can avoid that loss if you use the CLAYJECTOR to process your mud — rejecting unwanted clays and retaining expensive barite.

Since you get more than 70 per cent clay rejection efficiency with the CLAYJECTOR, you need process only 140 barrels of mud to reject the equivalent of all the clay from about 100 barrels of mud. This low volume of fluid processed keeps oil and chemical losses at a minimum.

Because barite recovery efficiency is 80 to 90 per cent, you lose less than one fifth of the barite in the mud being processed — a negligible amount out of the whole system.

To summarize, you save over $300 for every 100 barrels of mud you would have jetted — if you use the CLAYJECTOR instead of jetting. *Even when you deduct the cost of the CLAYJECTOR, you still can save well over $200 per day.*

This example may not apply precisely to your conditions, but your nearby Swaco sales engineer is ready to help you estimate your probable saving. Call him for more information.

SWACO®

SALT WATER CONTROL, INC.

1809 Continental National Bank Bldg.
Phone: ED 2-4433
Ft. Worth 2, Texas

CUT PUMPING COSTS

Specify CONTINENTAL-EMSCO

PRODUCTION EQUIPMENT PACKAGES

TAME PROBLEM WELLS with D+B pumps engineered for your profits

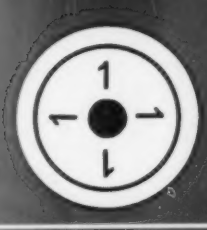
Why pay for excessive subsurface pump failures? Have a D+B Production Equipment Specialist *engineer* a longer lasting pump to reduce costly pulling jobs. He'll design it for your well's *peculiarities* . . solving such problems as: corrosion, gas, sand, high or low volume demands, crooked hole or changing conditions due to waterflooding, acidizing, sand fracturing. D+B pumps are designed to operate in *engineering harmony* with your other pumping equipment for lowest over-all pumping cost.

Cut costs, too, by using your nearby D+B pump shop. Here factory training puts the D+B pump specialist way ahead in subsurface pump application and repair . . gives him added judgment so necessary in selecting the *right* replacement part to meet a particular well condition for longer pump life . . greater efficiency.

Start now to cut your pulling costs by specifying D+B pumps and service from Continental-Emsco . . a fully integrated supply company dedicated to developing and providing the equipment and service you need to cut production costs.

Continental sucker rods
.. engineered to PUMP LONGER

With deeper wells going on pump .. corrosion developing from waterflooding .. inhibited wells .. it takes an *engineered* string to keep your equipment repairs and pulling costs down .. profits up. It's here that Continental-Emsco, a fully integrated supply company, is superior to local supply sources in assisting your engineering department or in operating independently to develop a rod string that's *profit-engineered* especially for you.

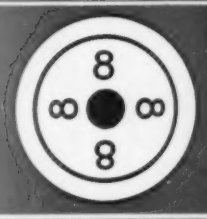


CONTINENTAL # 1 SUCKER ROD

An economical rod with tremendous staying power in noncorrosive wells or where an inhibitor is used . . yield strength range 60-75,000 psi.

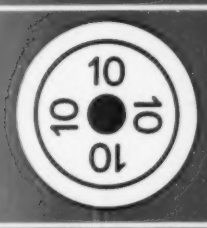
CONTINENTAL # 5 SUCKER ROD

A medium priced rod with an amazing performance record, primarily due to vanadium, which gives it a strength equalling many so-called "high tensile" rods . . yield strength range 71-92,000 psi.



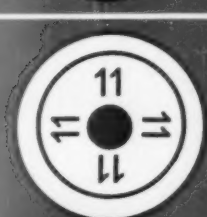
CONTINENTAL # 8 SUCKER ROD

The new Continental #8 rod is priced lower than Continental's premium #10. It offers a moderate degree of corrosion resistance plus top load capacity . . typical yield strength 113,000 psi.



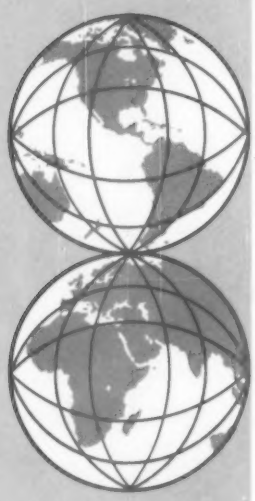
CONTINENTAL # 10 SUCKER ROD

The premium quality of this rod results in exceptionally long pumping life in deep, problem and hard pumping wells, where its high ductility and corrosion resistance pay off . . yield strength range 95-110,000 psi.



CONTINENTAL # 11 SUCKER ROD

The finest rod in the Continental line. Its low carbon and high nickel content provides high load carrying capacity in corrosive wells . . yield strength range 90-105,000 psi.



WORLDWIDE SERVICE

You can always depend upon the superior performance of Continental sucker rods, whether you operate statewide . . nationwide . . worldwide. This dependable performance is maintained by unexcelled quality control at C-E's plant and constant supervision of C-E stores and representatives throughout the world.

CUT COSTS WITH ACCESSORIES IN HARMONY WITH THE COMPLETE PRODUCTION UNIT

D+B QUICK-GRIP CLAMP

See how simple it is for one man to tighten this clamp. "Knuckle-busting" is completely eliminated.

CONTINENTAL-EMSCO API POLISHED RODS

Whatever your well condition, you can *top* your sucker rod string with one of five Continental polished rods and be assured of the highest quality in workmanship and materials with longer service life.

GREEN TRIANGLE SUPER V-BELTS 40% MORE CAPACITY NO PRICE INCREASE

These features . . new type fabrics . . unitized cover . . latex impregnated cord fibers with cord set in belt under tension . . no inner or outer joints or laps . . give GREEN TRIANGLE SUPER V-BELTS longer life, uniform loading and less vibration. Also, flexibility has been retained for easier bending over sheaves, while stretch has been reduced for less field adjustment. Belts are packed in *matched sets* to guarantee uniform, superior performance from each one. They are manufactured by New York Belting and Packing Company, America's foremost producer of oil field rubber goods.

CONT FOCAL P PRODU

Wherever you South Americ the world, you stores or repr there. This m proven produ personnel to and a dependa ment parts. *worldwide* . . g

Quick Service from Local D+B Pump Shops

Continental-Emsco Store at Maracaibo, Venezuela

NTINENTAL-EMSCO IS THE POINT FOR SALES AND SERVICE IN DUCING AREAS THROUGHOUT THE WORLD

you pump oil in the U.S.A., Canada, erica or remote producing fields of you'll find that Continental-Emsco representatives have preceded you s means a world-wide supply of oduction equipment, experienced to help in equipment application, ndable source of repair and replace- ts. So, remember when you go . . go *Continental-Emsco.*

For Service that Sings . . Equipment that Hums . . Go

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Serving the Oil and Gas Industries ... Worldwide

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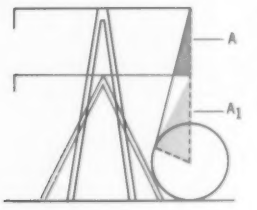
Representatives in All Principal Oil Fields of the World

P920-R Litho in U.S.A.

CONTINENTAL-EMSCO UNIT PUMPERS

PERFORM BETTER BECAUSE THEY'RE ENGINEERED BETTER



Taller samson posts reduce angle A (compare with angle A_1). This improved geometric design makes well loads more nearly equal at wrist pin and polished rod for added efficiency. There's less load and wear on bearings, gear teeth, belts and prime mover.

See in the sketch how torque has been reduced by the smaller angle between pitman and walking beam. This improvement reduces loading on gear teeth, cuts electric costs or fuel consumption and makes counterbalance applications more effective . . often eliminating the need for buying extra weights. Today . . more than ever before . . you can match a unit to individual well requirements, thanks to C-E's wide range of sizes and unmatched counterbalancing method. No need to buy a costly oversized unit or worry with the increased maintenance caused by overloading an undersized unit.

C-E unit pumper's maintenance costs have been reduced with prelubricated bearings, and bearing life has been extended by using bearings with B-10 rating. Standard QD sheaves simplify replacement and reduce cost. Oil troughs have been cast into the gear reducer to simplify gear inspection and cleaning and to improve lubrication.

Start cutting your production costs, specify C-E unit pumpers . . *profit-engineered* for you.

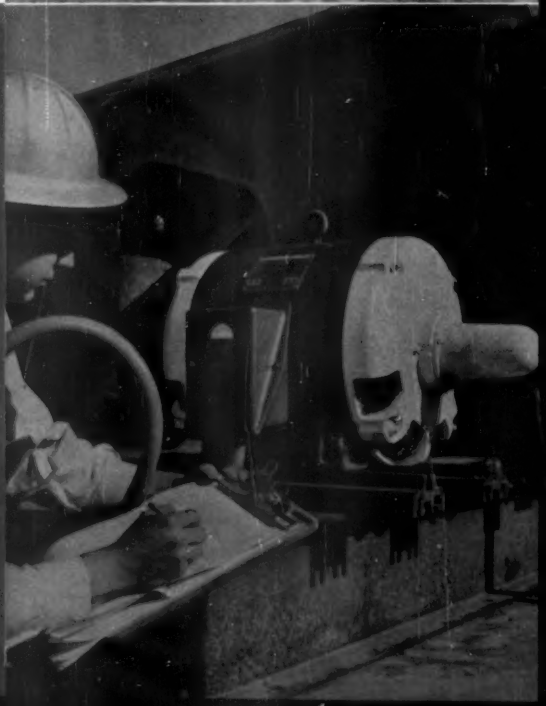
LIFTING COSTS with the complete
NENTAL-EMSCO PRODUCTION PACKAGE

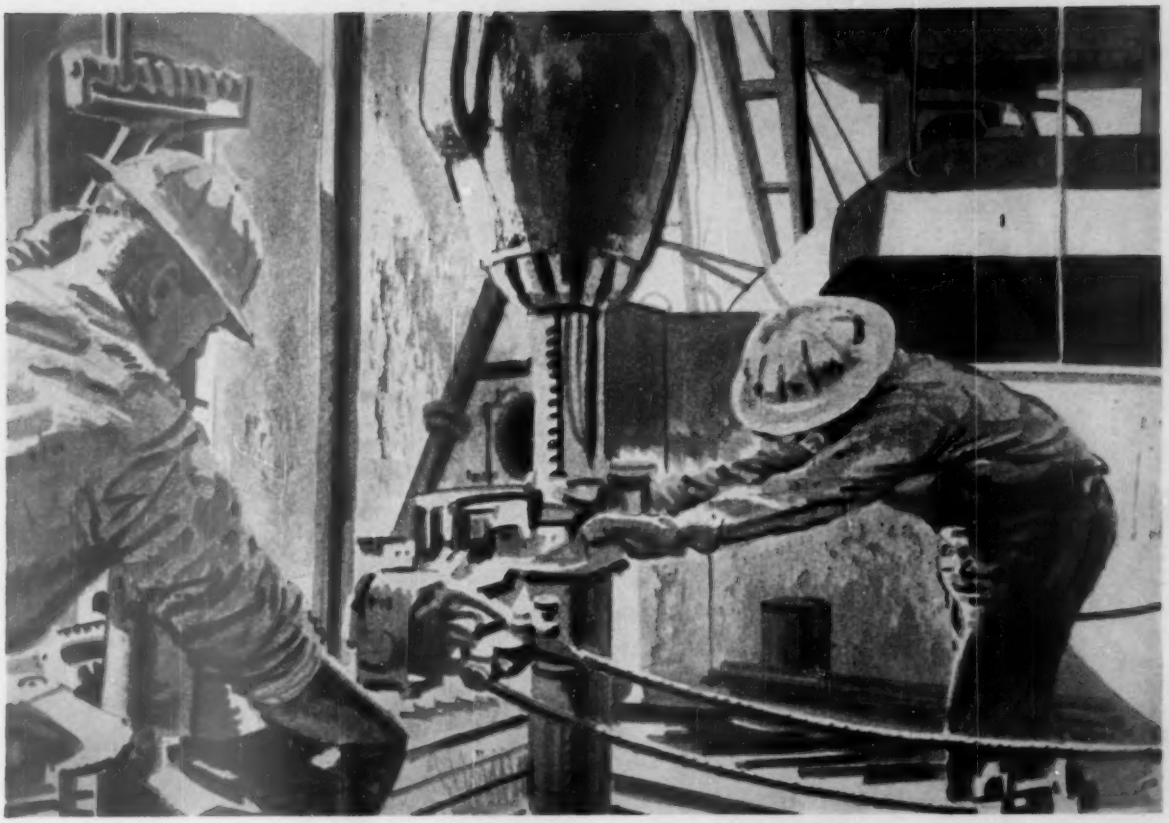
CONTINENTAL-EMSCO ENGINES

These engines greatly reduce pumper's servicing time due to engine's easy-to-start, easy-to-adjust and easy-to-maintain features. C-E engines maintain production schedules in all types of climatic conditions. Simple design, easy accessibility of working parts and unit assemblies cut repair time.

C-E GREEN TRIANGLE ELECTRIC MOTORS

Designed exclusively for rugged oil field pumping, these motors provide steady, sure, economical power. They have 5-8% slip . . 275% starting torque . . 40° C rise with a guaranteed 1.15 service factor. A built-in balance meter makes it possible to accurately balance your well. And by glancing at the meter, field personnel can detect subsurface trouble.





DRILLS 20% FASTER

SMOOTHER THAN STEAM

MAKES 5,000-FOOT ROUND TRIP IN THREE HOURS

Make a 5076-foot round trip out of a 7⅞" hole in only 3 hours and you're really moving that string—especially when you've got only 424 horsepower on the drawworks.

That's what Manahan Drilling Company of Oklahoma City is doing with its newest rig. The secret? The TORQMATIC DRIVE on their Bethlehem drawworks.

Marvin Richards, the Tool Pusher on the rig, says TORQMATIC is the reason they're making round trips so fast—drilling 20% faster—why the rig is far easier to run – one reason why they've never had a breakdown since they got the rig.

TORQMATIC's no stranger to the Manahan camp. This drilling contractor operates another rig with this "smoother than steam" drive—getting the same performance with that rig, too.

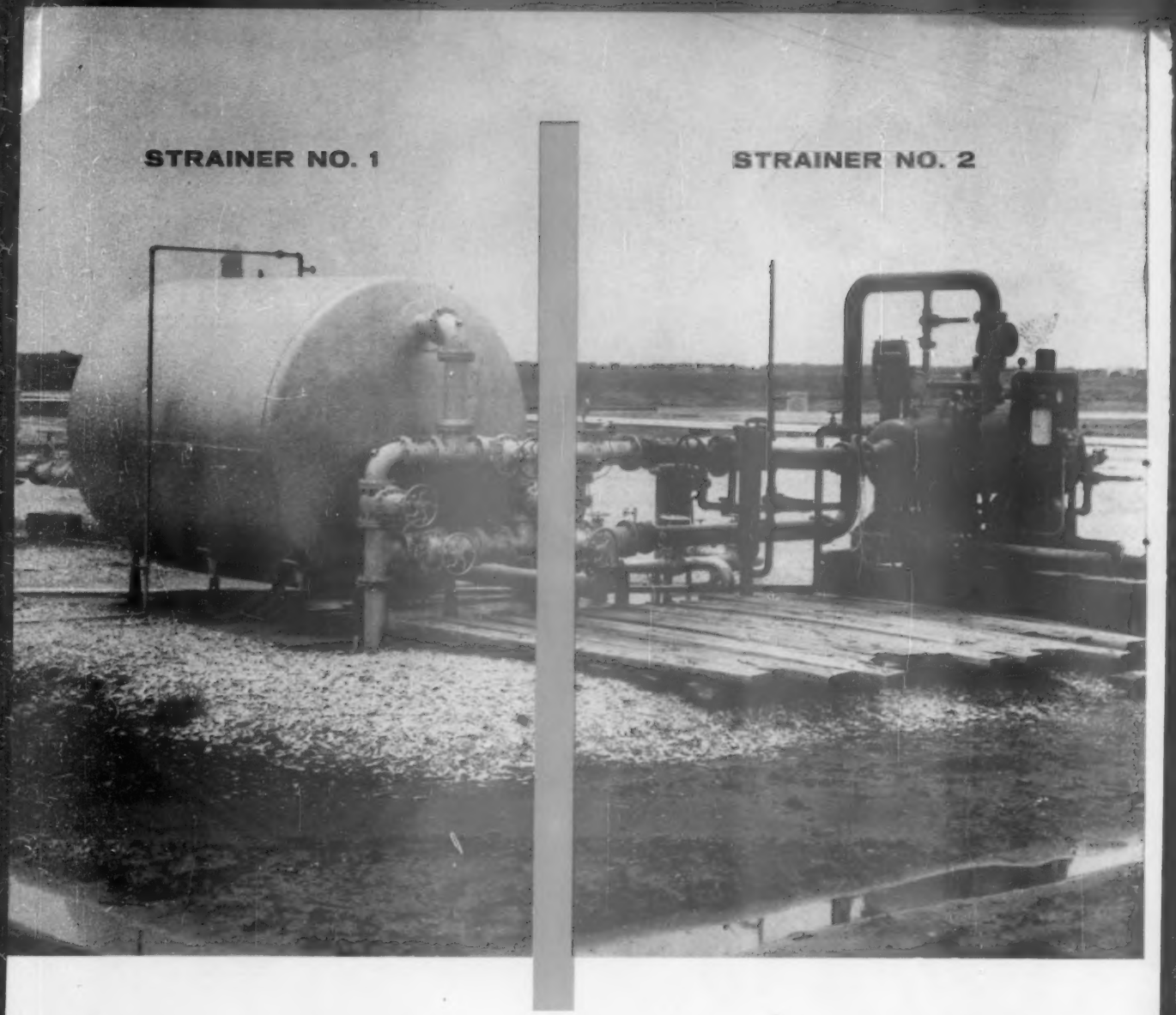
"Run up against something in the hole with that TORQMATIC and you won't tear up anything on the rig," Tool Pusher Richards says. "It'll take the shocks and extra strains that would be a problem on a rig without TORQMATIC."

Your drilling, servicing and fracturing jobs will get done a lot faster – with far less trouble – if you have a TORQMATIC DRIVE working for you. They're available from most leading oil field equipment manufacturers – or see your Allison dealer or write Allison Division, General Motors, Indianapolis 6, Indiana. In Canada: General Motors Diesel Limited, London, Ontario.

Allison

TORQMATIC® DRIVES

THE MODERN DRIVE FOR MODERN EQUIPMENT



How much water can a strainer strain?

The answer is important in water-flooding

Strainer No. 1 is a conventional rapid sand filter. It is designed to filter *180* gals. of water per minute.

Strainer No. 2 is a Model 30-H. T-C Jet Strainer. It is designed to filter *450* gals. of water per minute.

The cost of the two strainers is approximately the same, considering the cost of auxiliary equipment required by the sand filter that is not needed with the Jet Strainer.

To clean the sand filter requires backwashing with filtered water. This takes time . . . costs money. The Jet Strainer can be cleaned in less than 5 minutes, requires no backwashing.

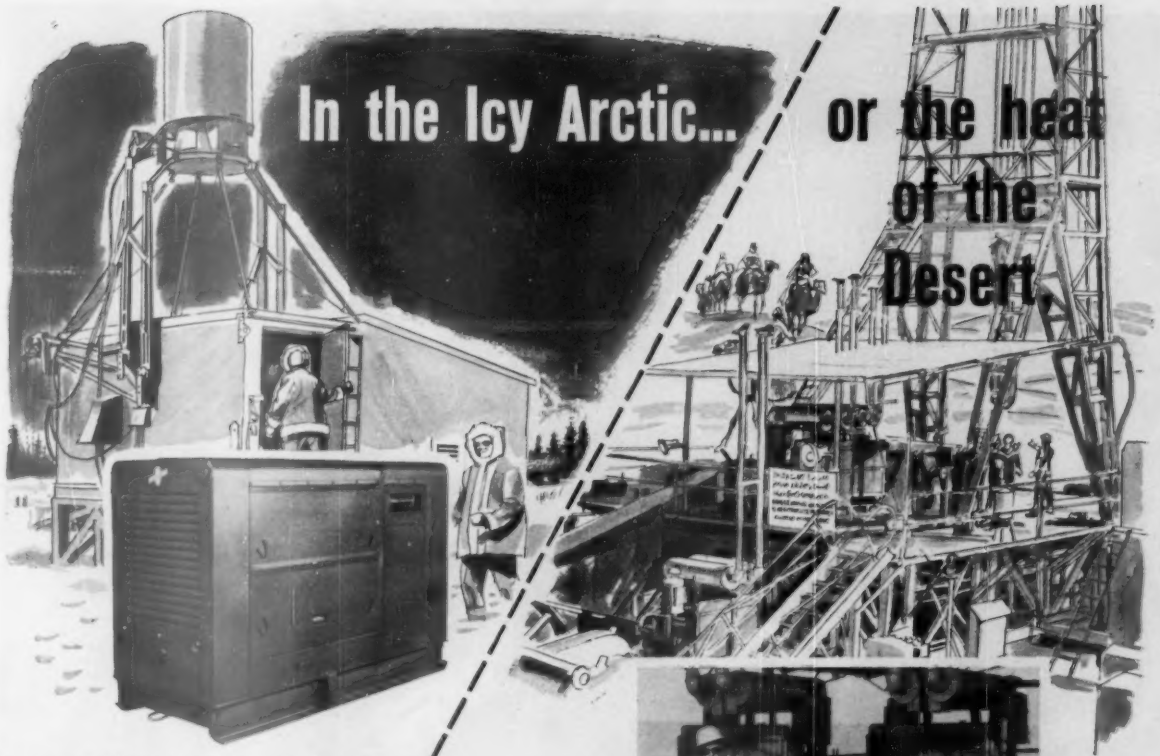
But the real pay-off is the difference in the filtering performance of the two types of strainers. The sand filter removes solids of a questionable minimum particle size . . . no algae or bacteria. The Jet Strainer can remove all solids down to 31-micron particle size with a bare screen. With a coating of filteraid on the screen the Jet Strainer removes all solids down to sub-micron particle size, including algae and bacteria!

Jet Strainer design lends itself ideally to full automatic operation, using any desired make of electronic controls.

Planning a water-flood? We will gladly send you complete details on T-C Jet Strainers.

T-C JET
Self Cleaning
STRAINERS

THORNHILL CRAVER CO.
P. O. Box 1184 Houston, Texas



Model MB-2 Stewart & Stevenson 30 KW Diesel Generator Set generating power around the clock. The unit provides electric power for operation of electronic apparatus vital to human safety and communications in the Arctic.

Parker Drilling Company rig, powered with GM Model 12103 Diesel Engines. Lighting and auxiliary power are supplied by a Stewart & Stevenson oilfield Utility Unit and Rig Lighting Plant. The engines were properly equipped and modified by Stewart & Stevenson with special cooling and air intake systems.

STEWART & STEVENSON

When it comes to diesel or gas engine power, Stewart & Stevenson experience and "know-how" have no boundaries.

Here again are two diesel engine power applications . . . in direct contrast and in opposite parts of the world . . . with one important characteristic in common: both were designed and built by Stewart & Stevenson Services, the world's largest distributor of diesel engines. Both power applications are serving vital industries where thousands of dollars and valuable contracts are totally dependent on the reliability and performance of this engine driven equipment.

When you need power . . . for any application in any part of the world . . . Stewart & Stevenson's experience, service organization and engineering will guarantee dependable performance. We will be glad to study your power needs and submit recommendations. Please write for additional information.

STEWART & STEVENSON

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"It is important to note that the unfolding possibilities of science and technology are likely to be realized at an even greater pace in the future. For discovery and invention feed on themselves. With every new discovery and invention we broaden the base upon which others are built."

– M. J. Rathbone, President

Standard Oil Company (New Jersey)

HOKE Flow Sheet 2

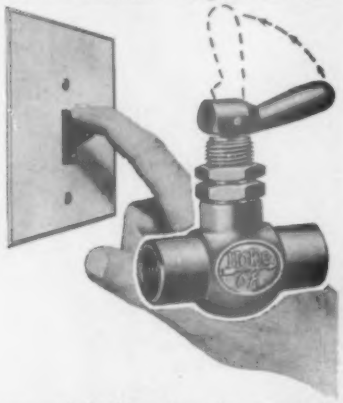
HOKE REPORTS ON FLUID CONTROL

WE'VE PACKED PERFORMANCE IN A PACKLESS VALVE

How to be "Flip" About On-Off Control

We've turned the tables on electrical engineering profs who try to demonstrate current flow by describing a valve on a pipe. Our switch-action toggle valves stop and start flow just as easy as: Flip, it's on! — Flip, it's off!

These valves perform a basically simple function, but a lot of engineering went into them to insure perfect performance. Many are used on precision test equipment and for control applications, often in conjunction with automatic controls as a manual safeguard for fast shut-off. Designed for both



gas and liquid service, the stem seals are tight enough for most vacuum work, too. We certainly can't be flip about these specifications.

Hoke manufactures two types of toggle valves. The 450 Series has maximum operating pressures up to 200 psi. These are spring closing valves made in ¼" and ⅛" pipe sizes which can be classified as "miniatures", measuring less than 2" in height in the closed position. They are normally supplied with moulded, black, Nylon handles, but colored handles can be supplied for special identification purposes. Panel mounting lock-nuts are included as standard equipment on every valve.

The second type is the 490 Series, a cam-closing toggle valve for service up to 2000 psi. They'll give you the same quick, positive action as the 450 Series, while performing the toughest laboratory and process jobs. The 490 and the 450 are excellent performers on non-critical high vacuum. They can be helium leak-tested for this purpose.

So, if you're interested in switch-action flow control, investigate the Hoke toggle valves. We'll be happy to equip you with complete technical data. A check in the coupon to the right will bring you the facts.

The development of packless valves has so greatly reduced the problems of handling high pressures, temperatures and vacuums, and dangerous fluids that engineers designing such systems can now spend more time curled up with the Hoke Corrosion Chart.*

With this extra time, many have dreamed up weird applications for the Hoke 440 Series bellows seal valve, trying to snare us in our own semantics. In a rash moment, we boasted that this valve could be modified for almost any application. Actually, the 440 can be modified to work at high pressures (up to 2000 psi), for high temperatures (up to 1000°F.), and for special connections such as tubing, socket welding, and silver brazing.

Aside from this horn-blowing, here are the dry facts. The basic design includes a stainless steel body, inert arc-welded bellows assembly, Teflon gaskets and Teflon stem point discs. This is only the starting point. Minor modifications make so many models available that almost any problem, including liquid metal handling, can be solved.

Hear what a disbeliever said: "I did not believe that the modified valves would satisfy all my requirements, especially to keep a high vacuum of the order of 10^{-8} mmHg under a wide variation of temperatures; however, I now acknowledge that the modified Hoke 440 valves fulfilled their duty perfectly." This came from The Martin Company, where we sent 440's for use in cesium vapor up to 400°F. Special

The cesium boiler shown above uses a modified version of the Hoke 440 series bellows seal valve (at right) to handle high vacuum of 10^{-8} mmHg and cesium vapor at tematures up to 400° F.

modifications made these valves readily usable on a cesium boiler and converted an infidel to the true valve.

If you work with critical high vacuum, high pressures, high temperatures and dangerous fluids, proceed with care. Ask for our Packless Valve Bulletin to reap a harvest of engineering plums.

** Makes good reading if you're handling corrosive agents. Write, and we'll send you one.*

FREE! A STEADY FLOW OF FACTS!

Further flow features, and interesting technical topics are carefully covered in Hoke's technical publication, the FLOW SHEET. It's free, but worth millions! To get the full benefit of our engineering and editorial efforts six times a year, mark your "X" in the proper box.

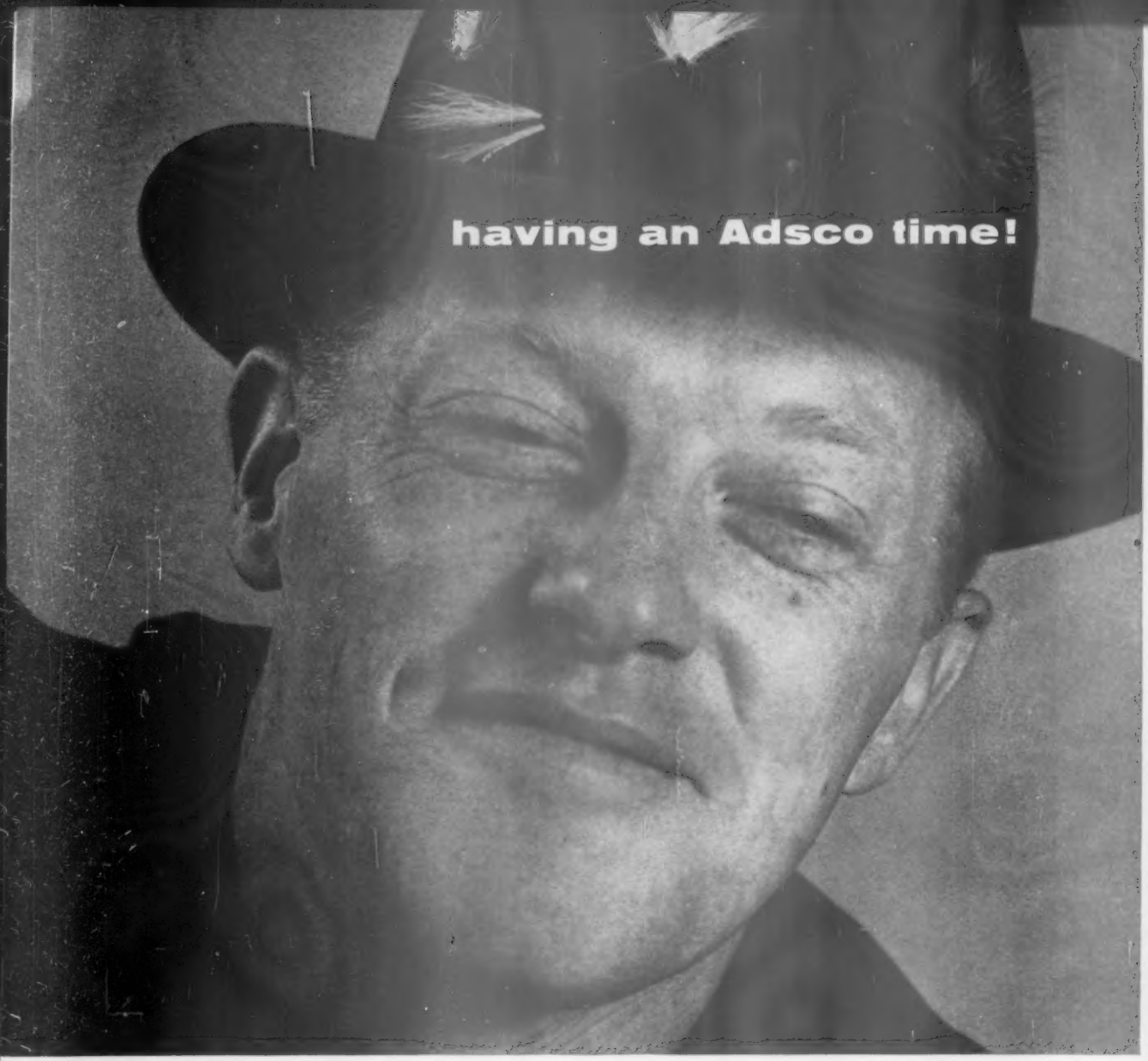
Hoke's Performance Guarantee — *Every Valve Leak-Tested!*

HOKE INCORPORATED
63 Piermont Road, Cresskill, N. J.

Send me complete information on the Hoke products checked below:

- ☐ Packless Valves
- ☐ Toggle Valves
- ☐ Flow Sheet
- ☐ FREE Corrosion Slide Rule
- ☐ Complete Catalog GC 959

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____



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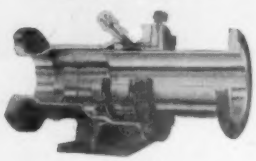
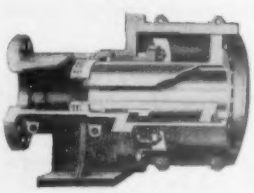


RAM-PAK



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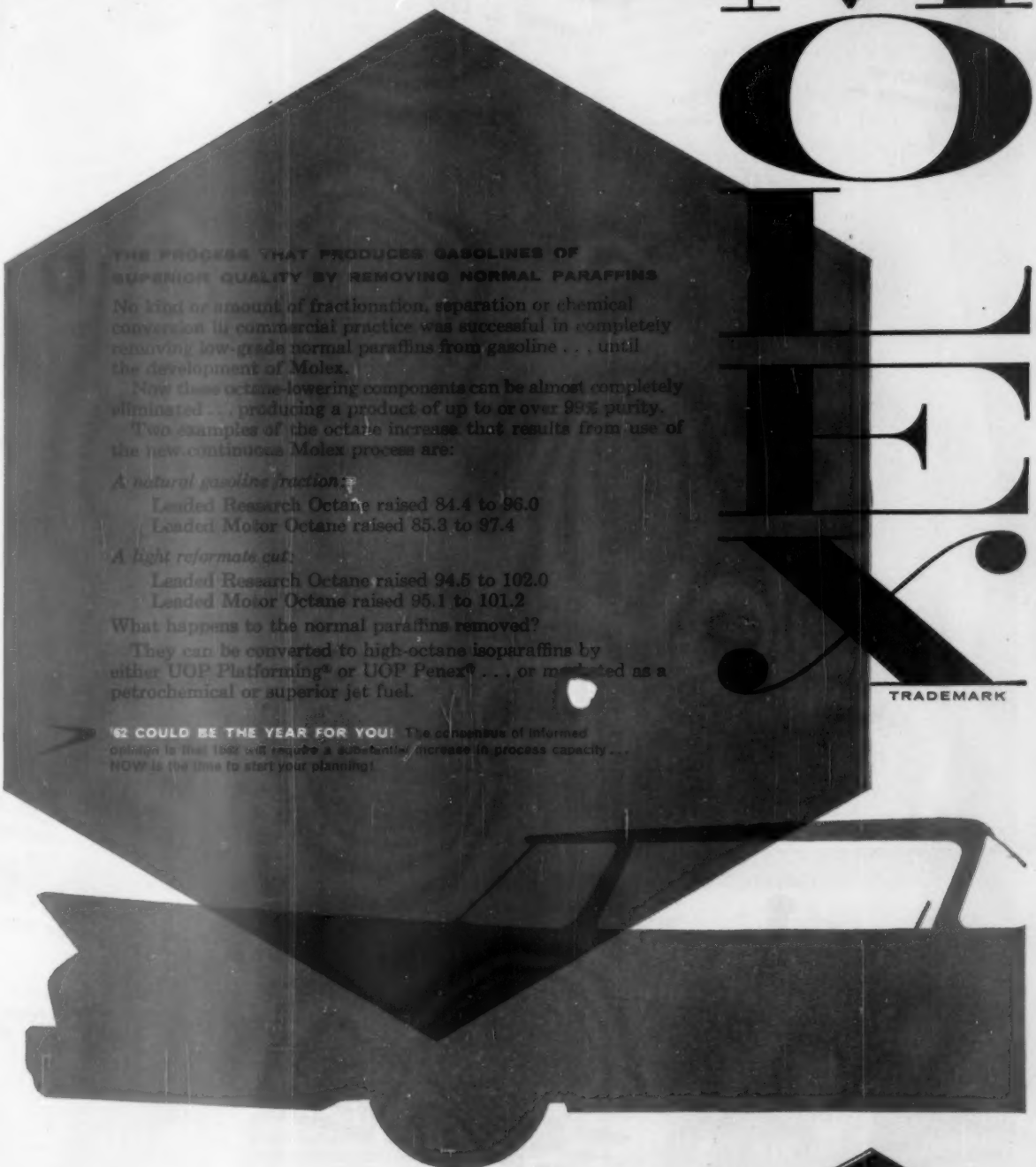
THE PROCESS THAT PRODUCES GASOLINES OF SUPERIOR QUALITY BY REMOVING NORMAL PARAFFINS
No kind or amount of fractionation, separation or chemical conversion in commercial practice was successful in completely removing low-grade normal paraffins from gasoline . . . until the development of Molex.
Now these octane-lowering components can be almost completely eliminated . . . producing a product of up to or over 99% purity.
Two examples of the octane increase that results from use of the new continuous Molex process are:
A natural gasoline fraction:
Leaded Research Octane raised 84.4 to 96.0
Leaded Motor Octane raised 85.3 to 97.4
A light reformate cut:
Leaded Research Octane raised 94.5 to 102.0
Leaded Motor Octane raised 95.1 to 101.2
What happens to the normal paraffins removed?
They can be converted to high-octane isoparaffins by either UOP Platforming® or UOP Penex® . . . or marketed as a petrochemical or superior jet fuel.
'62 COULD BE THE YEAR FOR YOU! The consensus of informed opinion is that 1962 will require a substantial increase in process capacity . . . NOW is the time to start your planning!

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WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

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Des Plaines, Illinois, U. S. A.

MONTEX DRILLING COMPANY
14 INDUSTRIAL LOOP
MIDLAND, TEXAS

TELEPHONE MUTUAL 2-1761

December 4, 1959

W. A. MONCRIEF, JR.
D. L. CHENOWETH, JR.

Twin Disc Clutch Company
1511 Turtle Creek Blvd.
Dallas 7, Texas

Attention: Mr. E. H. Bennett
Industry Manager

Gentlemen:

In August 1951 we placed in operation three Twin Disc 27" HUD Fluid Couplings on our Rig No. Three. At that time this rig was powered by three L-3000, 12 cylinder, LeRoi Engines driving through these couplings into a Unit Rig Model U-37 chain compound with two pump drives besides the drive to the Drawworks.

The first overhaul on these couplings was during the month of July 1955 after having been in operation approximately 24,000 hours and having drilled 93,498 feet of hole. The engines were overhauled at the same time and the units put back in operation on the same compound. In August of 1959, after another 21,000 hours of operation, the couplings were again overhauled and put back in operation behind three new V-125, 12 cylinder, Climax Engines. The compound was also overhauled and three chains and three bearings replaced; this being the first bearing or chain replacement to be made in this compound during this eight year period.

Our total overhaul and maintenance costs on these HUD Couplings during this period of time in which they have operated a total of 45,000 hours and drilled twenty-five wells for a total footage of 233,995 feet has been less than $1,500.00 per coupling. We consider the above chain life in this compound as nothing short of phenomenal. The average chain life in this type installation is probably less than two years and as pointed out above, some of the chains in this compound are still operating after eight years of use. The same applies to the bearing life which we have experienced in this drive.

Although it is hard to put a dollars and cents value on the other advantages which we have benefited from as a result of these couplings the following are some of them which we feel are very important:

-1-

December 4, 1959

Twin Disc Clutch Company

1. Although I have only pointed out the exceptional chain life on the compound on this rig we feel that the chain drives in the drawworks have also been extended measurably.

2. With these couplings it is possible to handle our drill pipe and casing much more easily, thus preventing undue stress on them from shock loading.

3. The same applies to the operation of the two mud pumps on this rig. It is possible to operate these pumps more like steam pumps, which is ideal for drilling operations, because we can stall these couplings without killing the engines, and then gradually throttle the engines and build up the desired pump pressure slowly.

4. We also feel that the life of our engines between overhauls has been definitely extended. Because of these couplings it is impossible to "lug the engines down" and we have never broken an engine crank shaft, which occasionally happens with a straight mechanical drive.

These couplings have been overhauled both times by the Vance Supply Company in Odessa, Texas, who are the Twin Disc distributors in this area. We have been well pleased with their service and stocking of adequate parts with which to overhaul and maintain these couplings.

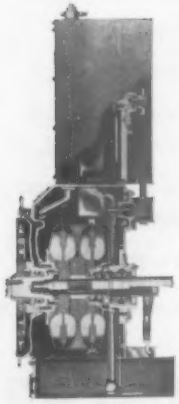
Yours sincerely,

MONTEX DRILLING COMPANY

O. L. Chenoweth, Jr.

O. L. Chenoweth, Jr.

OLCJr:jc



Twin Disc Disconnecting Fluid PTO — Model HUD

boosts drilling rig performance, extends equipment life

Model HUD disconnects power source from driven equipment to permit clutch engagement with engines idling . . . reduces impact shocks 70% or more. It also eliminates "engine fighting" to assure balanced distribution on compounds. Isolation of torsional vibrations plus elimination of slow-speed lugging saves wear and tear on engines. Operational life of chains, clutches and other running parts is substantially increased. Model HUD's dampening effect prevents load oscillation—power is steady in one direction. Furnished as a "package" with 21" or 27" double-circuit fluid couplings for engines with SAE #0 and #00 housings in the 100 to 850 hp range. Write for Bulletin 506-A. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin.

TWIN DISC

TWIN DISC

Fluid Couplings

This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

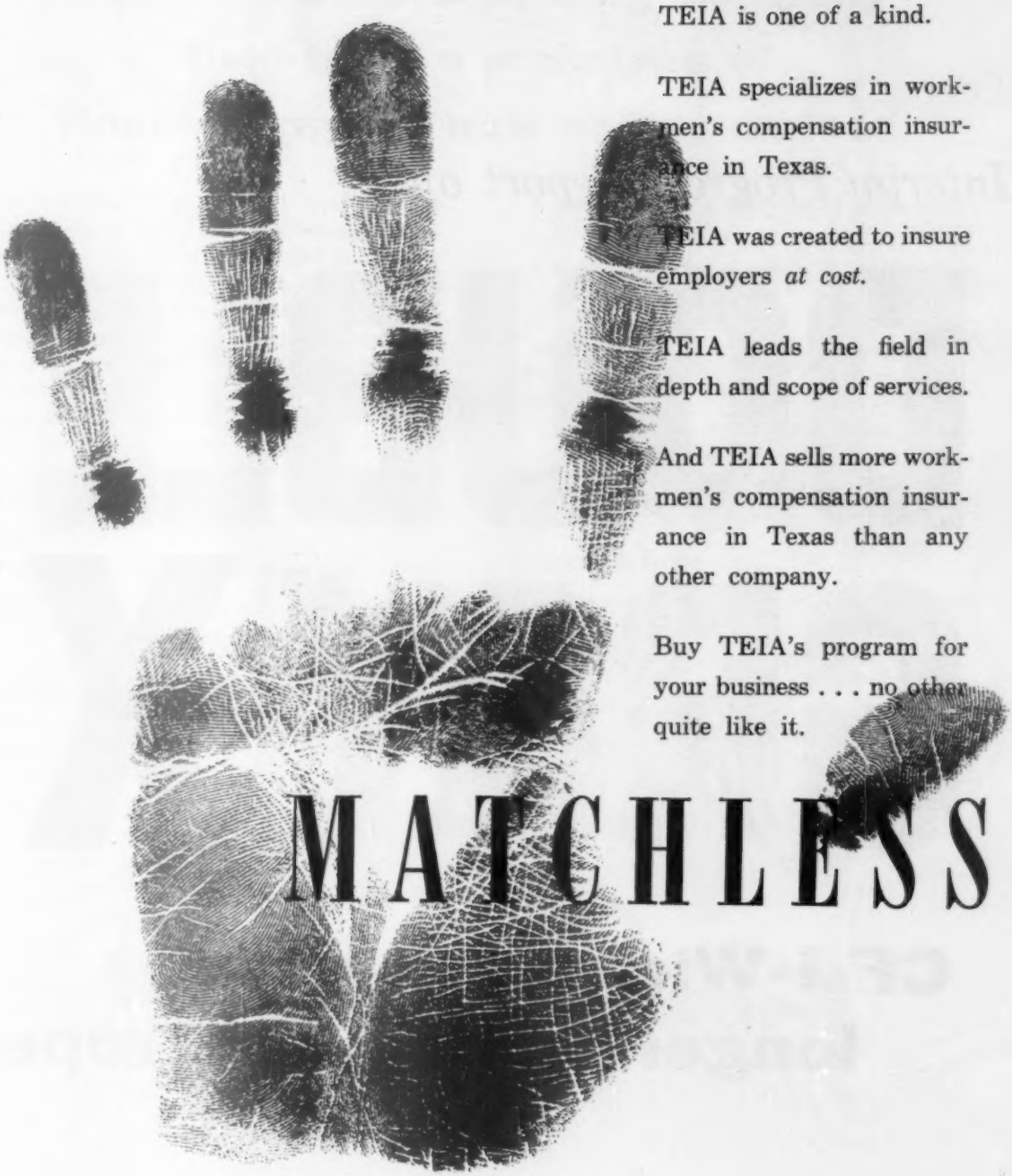
The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

- No internal wearing parts.
- No valves, pistons, or vanes.
- No internal lubrication.
- Low maintenance cost.
- Saves floor space.
- Desired delivery temperature automatically maintained.
- Slugs of liquid entering pump will do no harm.
- 75 pounds in a single stage.

NASH ENGINEERING COMPANY
313 WILSON, SO. NORWALK, CONN.



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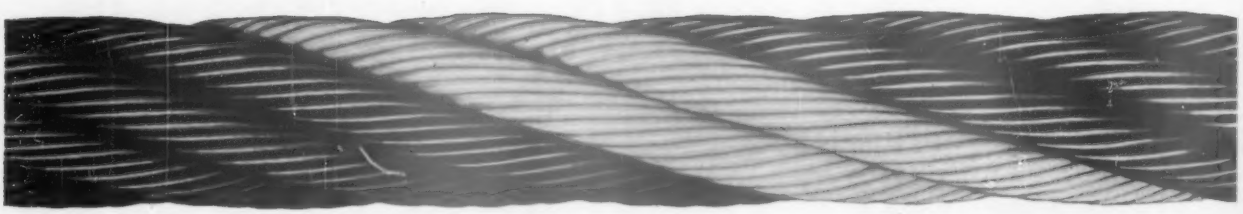
Interim Progress Report on ...

DOUBLE GRAY-X®

CF&I-Wickwire's new longer-lasting wire rope



Falcon Seaboard Drilling Company field tests a prototype of Double Gray-X — now orders carload

The first company to use a prototype of Double Gray-X was the Falcon Seaboard Drilling Company of Tulsa. Aware that modern drilling practices demand the best possible equipment, Falcon Seaboard tested Double Gray-X on some of their rotary drilling rigs, an operation that subjects ropes to extreme abuse. Mr. Jack Starr, Vice President in Charge of Drilling, commented, "The results obtained from original tests with Double Gray-X prototype led to our decision to order *a carload of this improved product*. Falcon Seaboard insists on the best products, in order to serve the oil industry in accordance with today's modern standards."

The Secret of Longer Rope Life

CF&I-Wickwire engineers, after intensive research, discovered that by using an entirely new wire drawing technique—including the use of Molysulfide* in the lubricant—the characteristics of the wire rope were greatly improved. This method creates a permanent molecular jacket around the individual wires that provides these benefits:

- **reduced friction between the individual wires in each strand of Double Gray-X during service**
- **minimized surface imperfections in the wires of Double Gray-X**
- **wires have greater resistance to abrasion, crushing and bending**

If you are a user of wire rope, you can *increase* the safety of your operation and *reduce* equipment downtime with Double Gray-X. Made in a wide variety of sizes and constructions, Double Gray-X is recommended for all types of equipment. For complete details on this new wire rope, call the nearest CF&I sales office or see your local distributor.

Greater Strength

The molecular shield around this new premium wire rope gives Double Gray-X longer life. In addition, you get the *extra strength* for which Double Gray has always been famous. Made of extra improved plow steel with an Independent Wire Rope Core of the same material, this rope gives 15% higher breaking strength than the catalog breaking strength of an improved plow steel rope with IWRC.

*Registered Trademark of Climax Molybdenum Co.

7823

CF&I STEEL

WICKWIRE ROPE

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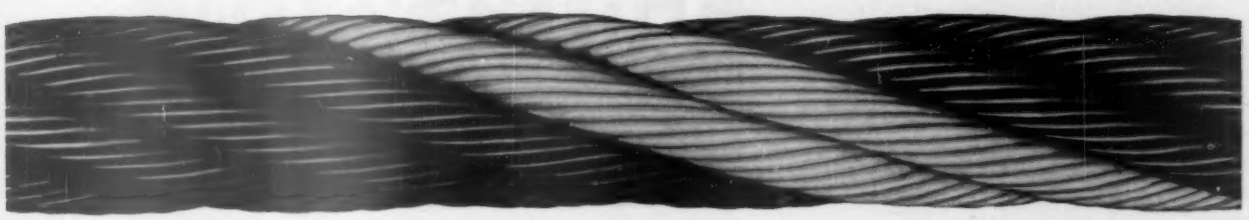
In the East: WICKWIRE SPENCER STEEL DIVISION — Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) New Orleans • New York • Philadelphia



GUIBERSON DRILL PIPE PROTECTOR RUBBERS

Stay Put.. Keep Their Grip.. Keep Their Size..

Guiberson drill pipe protector rubbers show their quality when we first put them on your pipe. And in the hole, they *stay put.* They can work in high temperatures or in oil base drilling muds— take a powerful amount of wear and abuse. *They keep their grip.*

You get extra casing protection and extra performance from Guiberson protector rubbers because they're made from a special wear-resisting rubber compound, designed for universal application in all kinds of drilling. And you get it because Guiberson just plain *knows how* to mold and compound rubber products that can take the tough jobs in today's wells— and lick them.

That extra rubber know-how comes from Guiberson's long years of experience in manufacturing rubber products specifically for the oil industry. It comes from a rubber plant and laboratory staffed and equipped to do the specialized job right. When you want drill pipe protectors that won't walk and do maintain their original OD for a long, useful life, look to Guiberson for the answer.

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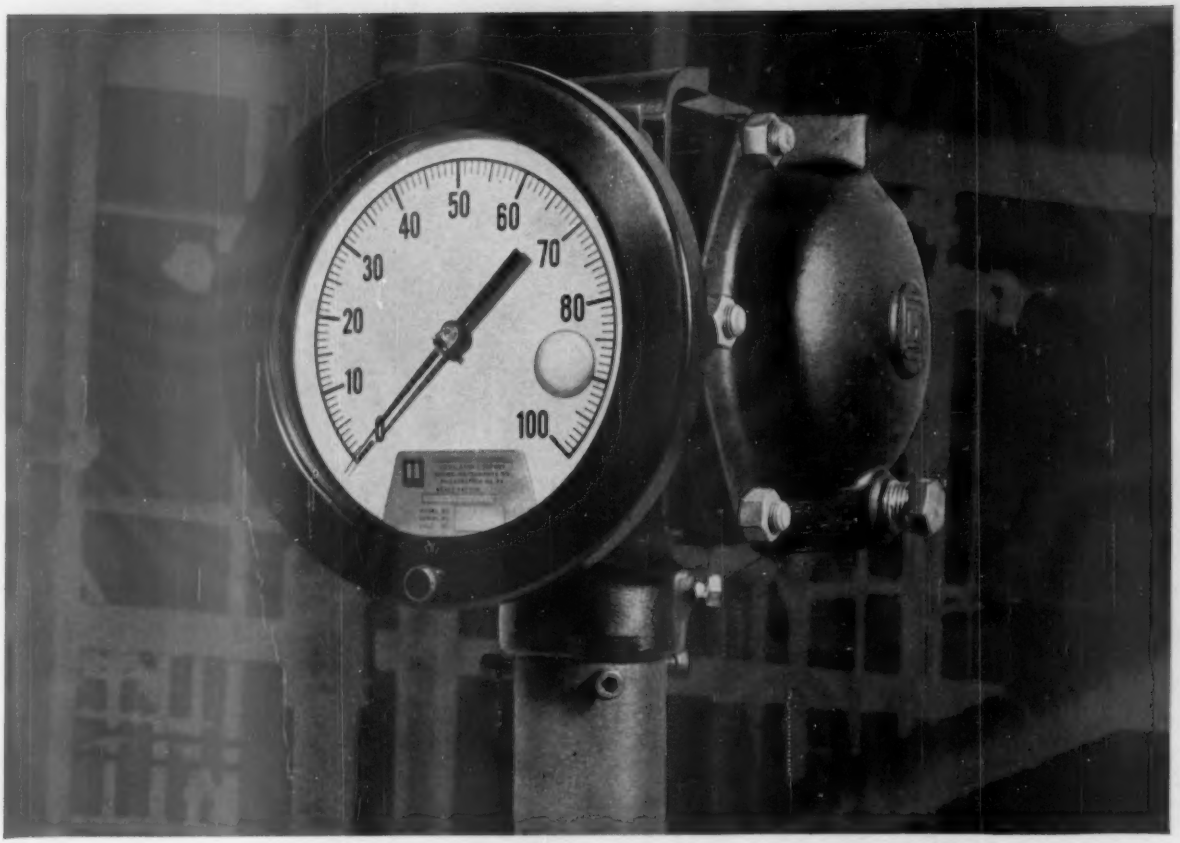
ESTABLISHED 1919 — DALLAS, TEXAS U.S.A.

ONE OF THE DRESSER INDUSTRIES



New indicating bellows meter is accurate, rugged and safe in any atmosphere

Use this new bellows meter for any flow or liquid level application where you want local indication, but don't need recording or transmission. It combines the advantages of the mercuryless bellows meter body with the convenience of an easy-to-read 6-inch dial indicator.

Make pressure connections from either the top or bottom of the meter body, depending on whether you want the meter to be self-venting, draining or purging. And forget corrosion worries; all parts of the bellows exposed to process fluids are of seamless stainless steel construction.

This rugged meter will perform accurately in the toughest service. Two meter bodies are available with pressure ratings of 1000 and 2500 psi, tested at 1500 and 4000 psi respectively. And you can use the meter in hazardous atmospheres because it is self-powered . . . at any ambient temperature between –40° and +250°F. In the indicating movement, a stainless steel pointer pinion and a nylon-faced gear sector assure long life and sustained calibration accuracy of ±1% full scale (ranges of 0-50 inches of water and above) and ±1¼% full scale (ranges below 0-50 inches of water).

This new bellows meter has many other features . . . ease of calibration, simple range change, automatic ambient temperature and static pressure compensation, to name a few. Your nearby Honeywell field engineer can give you complete details. Call him today . . . he's as near as your phone.

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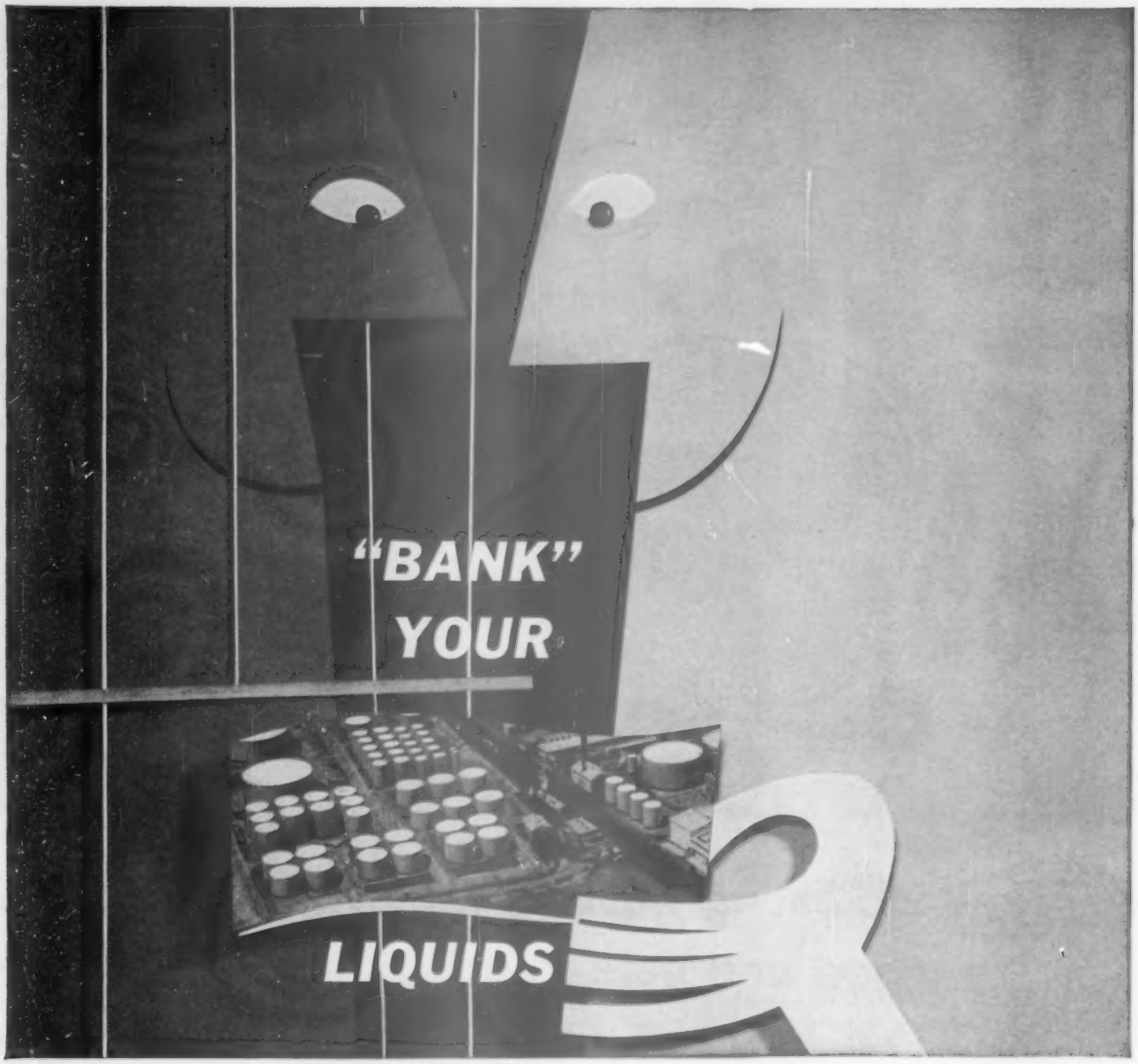

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General American Tank Storage Terminals give you a wide range of "in & out" handling methods!

At General American's Tank Storage Terminals, you can bring liquids in or take them out by tanker, barge, tank car, truck, pipeline or packaged.

Today, the six General American Terminals offer you nearly 16,000,000 barrels of storage capacity. Terminals are located within 500 miles of *almost all* the top markets. You get these benefits:

- Complete privacy of storage.
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- Lease *what* you need *when* you need it.
- Avoid the capital expenditures of a tank storage terminal and its operation.
- General American's warehouse receipts are accepted as the highest type of collateral.

For further information, call or write our nearest district office or terminal.

Terminals located at:
Carteret, N.J. (Port of New York), Chicago, Ill., Corpus Christi, Texas (Port of Corpus Christi), Pasadena, Texas (Port of Houston), Galena Park, Texas (Port of Houston), Good Hope, La. (Port of New Orleans).

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GENERAL AMERICAN TRANSPORTATION *a division of* **CORPORATION**
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TANK STORAGE TERMINALS GENERAL AMERICAN TRADE MARK

A trip to the National Supply Store gave this driller a new slant on communications

When one of our men in a National Supply Gulf Coast store demonstrated a new electronic megaphone, he made a fast sale and also demonstrated an important truth.

An employee in the back of the store used the device to greet a driller as he entered the front door. The giant voice of the Ranger transistorized megaphone boomed through the store, and demonstrated the possibilities of the amplifier so well that the driller left with two. He planned to use them on an off-shore drilling location, where wind and storm often made shouted directions difficult to hear.

The truth demonstrated was this—*there is nothing like regular trips to the store to keep abreast of new products and developments.* National Supply field salesmen do their best, but they can't possibly tell you of everything new and useful that the store has stocked. "Going shopping" is the best way we know for you to keep informed on modern items. You will usually spot something you can profitably use.

You will also notice that every product you see on National Supply store shelves has a brand name you know and respect, such as Champion spark plugs, Westinghouse motors, Aeroquip fittings, Oilmaster pumps and W-K-M valves.

On next pages: **NATIONAL PUMPING UNITS AND SUCKER RODS**

WHAT DO YOU WANT

This "high drive" National pumping unit is in service in West Texas. Note the small, relatively inexpensive foundation; the elevated motor and V-belt drive placed above blowing sand and high water; the compact design that minimizes installation costs. Investigate the many cost-saving features of this National unit soon.

MOST IN A PUMPING UNIT?

Easy counterbalance system?
Two-direction gear reducer?
Ground level lubrication?
Hinged arc hanger?
Modern crank design?
Frictionless bearings?

YOU GET ALL THESE FEATURES ON ALL NATIONAL PUMPING UNITS...WITHOUT PREMIUM!

Whether you buy a high drive or portable base or long stroke in any of the 13 National basic pumper sizes, these features are standard.

You get effective counterbalancing at leading, lagging or synchronized positions.

Self-adjusting, hinged arc hanger folds back for easy well servicing.

Two-direction gear reducers give you extra latitude in prime mover placement and extended life of reduction unit.

Ground level lubrication increases safety and convenience in maintenance.

Gear reducer is placed on sub-base of crank-counterweighted National pumpers. This places it at a height which prevents weights from traveling below the unit base, eliminating side pit digging for clearance. Split cranks are used for easy field removal and placement.

Frictionless bearings on all National models mean minimum horsepower usage and consequent real dollar savings to you, as well as increased bearing life. Dust excluders on all bearings lengthen life of oil seals and bearings.

Next time you buy pumpers, call your nearby National Supply representative. He'll prove to you that your best investment is in National pumping units.

More on next page . . .

WHAT DO YOU WANT MOST IN SUCKER RODS?

A grade to meet your particular well conditions?
Factory quality at well site?
Availability when you need them?

National sucker rods are readily available to you from field stocks like these at our Odessa, Texas, store.

You get all these with National rods. You can choose from six grades of National rods that are engineered to suit your needs. And you get the quality that results from National Supply's modern manufacturing techniques on *specially designed* equipment.

You can count on this factory quality at the well site. National Supply's packing, shipping and storage procedures go far beyond normal handling of sucker rods. You always receive National rods in factory-perfect condition in standard packages.

If availability is most important, you're ahead with National Supply. The largest supply store network in the industry insures you ordering convenience and on-time deliveries.

Call your National Supply representative next time you order rods. You'll be glad you did.

National Supply's high strength Grade 45 rod is a new grade now available for wells where there is little or no corrosion and heavy loads are encountered. This rod supplements National Supply's complete line of rods to meet every well condition from non-corrosive to highly corrosive salt water and sulphide. National Supply's new Grade 45 sucker rods are available in sizes ⅝ in., ¾ in., ⅞ in., and 1in., at a cost you'll like.

THE NATIONAL SUPPLY COMPANY
Two Gateway Center, Pittsburgh 22, Pennsylvania
Subsidiary of Armco Steel Corporation

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MAXITEST®

. . . the Ashcroft Gauge that gives you accuracy to 1/10 of 1% for testing other pressure instruments

Here is a unique master reference gauge of the most precise accuracy and easy readability. It is possible to calibrate to 1/10 of 1% accuracy, making it the finest test gauge you can use in maintenance work, field inspections, and in the laboratory. It is particularly useful in checking accuracy and calibration of test gauges, receiver gauges, transmitters, and other pressure-operated devices to 10,000 psi.

No Parallax Effect with Maxitest

The Maxitest has a durable lightweight Alumalife® case with convenient carrying handle. It is also available without handle and back connected for flush mounting. It has an 8½" Maxivision® dial—a two-level dial with needle-sharp pointer on the same plane as the tab graduations to eliminate parallax errors. Case and dial are painted contrasting "eye-rest" greens to assure surest, sharpest readability indoors and outdoors, without eye strain.

Metal Tabs Replace Dial Graduations

Adjustable metal tabs completely replace the usual printed major dial graduations. The standard number of graduation tabs supplied is determined by the psi scale range of the particular model desired. They are positioned near the outer circumference of the dial but can be precisely set individually to assure exact pressure reading at each point. (Up to 1/10 of 1%—the calibration standard of a deadweight gauge tester.)

Each tab is "hairline" marked to indicate any accuracy deviation—from ¼ of 1% to 1% of total dial graduation. A blank dial is available to permit the user to set the tabs as preferred.

Available in Pressure, Vacuum, and Compound Types—Total graduations range from 0/15 psi to 0/10,000 in pressure types with tab intervals appropriately assigned. 0/30" vacuum type has tabs at 2" intervals. Compound types have graduations 15 psi and 30" vacuum with tab intervals at 3 psi and 5"; 30 psi and 30" vacuum with tab intervals at 5 psi and 10". For testing receiver gauges, the Maxitest can be supplied with dial ranges of 3/15, 3/27 and 6/54 psi.

SEND FOR CATALOG

For complete information about the Maxitest or the complete line of Ashcroft test gauges and gauge testers, phone your industrial supply distributor—or mail the coupon for Catalog 300B.

MAXWELL MM&M MANNING & MOORE INC. TRADE MARK

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They Say—

When mail comes and why

Dear Sir:

In your April 4 Journally Speaking ("Mail Call," p. 55), you ask why you get more mail in March and August and ask the readers to tell you.

Well, "I dare say," as my son says, that the reason is that your customers have more time to kill then than at any other time.

Right now, I am sitting at home waiting for the postman to leave in my box some attorney's opinions on titles, and that accounts for this letter.

I will dare another say that if you classify your March and August mail you will find that the March mail comes from "snowed ins" up north and the August from "heat ins" down south, with maybe a scattering of vacationers trying to kill the time until they can be back home again.

J. R. McFarland
J. R. McFarland & G. J. McFarland
Oil and Gas Lease Operators
Karnes City, Tex.

Ashland ranked 23rd

Dear Sir:

In looking through your April 11 issue (p. 80), I noticed that Ashland Oil was not included in the tabulation showing oil companies' earnings for 1959.

I assume that this is because we are on a fiscal year basis ending September 30 rather than on a calendar year basis.

We usually prepare a statement converting our earnings to a calendar year basis, and this information was sent to the Journal shortly after the first of this year.

This letter should not be construed as criticism of your very excellent publication, which very seldom goes astray, but only as a reminder that Ashland Oil would like to be included in your next year's comparison of earnings. I believe we would have been 23rd in your table this year.

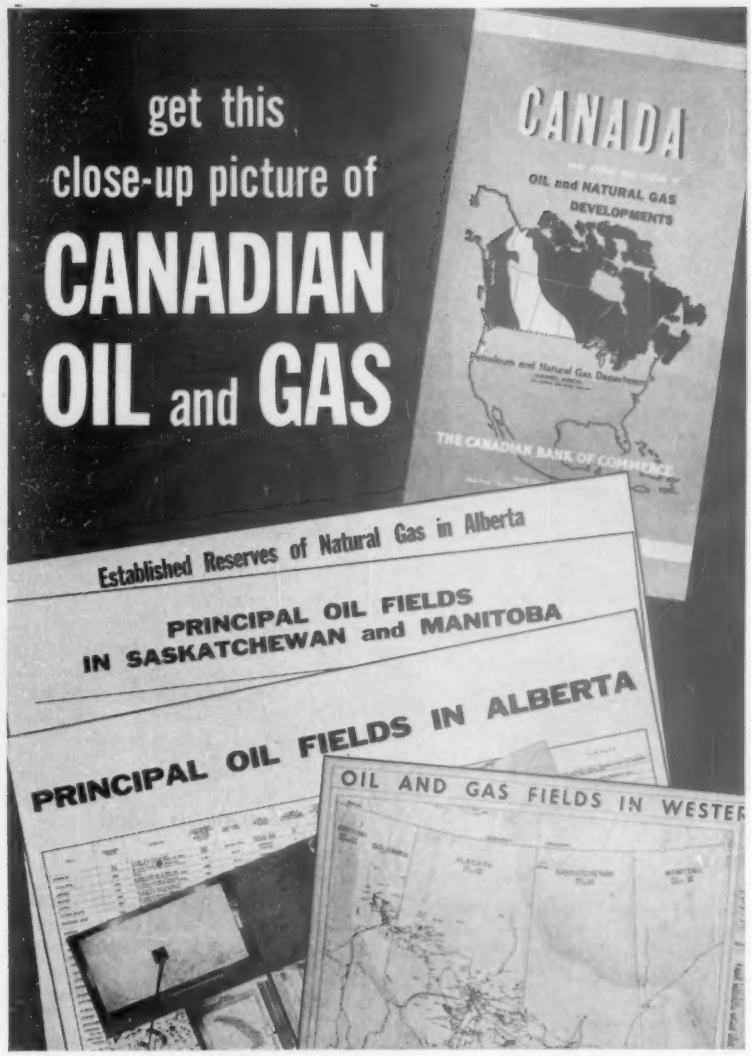
Rexford S. Blazer
Chairman
Ashland Oil & Refining Co.

West Coast will miss Dave

Dear Sir:

I read in the April 4 issue of The Oil and Gas Journal (p. 67) that David H. Stormont of your Los Angeles office is being transferred to New York as refining editor.

We in the association are sorry to



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see Dave leave the Los Angeles area. His editorial evaluation of the oil business is unmatched and he has been extremely objective in his approach to our problems. We are happy to see him advance with the Journal, but we shall miss him here on the West Coast.

Felix Chappellet
Vice President and General Manager
Western Oil and Gas Association

Pipeliners liked this one

Dear Sir:

I especially enjoyed the article in the March 14 issue entitled "1960's Biggest Pipeline Uses X-56 Pipe for Entire Main Line," (by Paul Reed, p. 142). It was also most favorably commented on by several of my associates.

H. Maurice Banta,
Assistant Director
Research and Technology-Applied
National Tube Division of
United States Steel Corp.

Dear Sir:

The March 14 article on the use of X-56 and construction methods was most interesting.

It would be of further interest to elaborate on other progress such as their (Transwestern Pipeline Co.'s) building, pump installations, etc.

Clifford J. Greer
Westinghouse Electric Corp.
Sunnyvale, Calif.

Dear Sir:

I want to thank you for the excellent article on the Transwestern job . . .

Harold C. Price, Jr.
President
H. C. Price Co.

Pemex story well received

Dear Sir:

Congratulations to you for the Journally Speaking on page 66 of the March 21 issue. The Mexicans here who read it were proud of your fine references to the men of the Mexican petroleum industry.

They also were delighted in reading the article "Pemex: Booming Bureau With Big Plans," (p. 90).

F. D. Smith
Petroleos Mexicanos
Salamanca, Mexico.

Journal's timely articles

Dear Sir:

We would like permission to reproduce Parts 1, 2, and 3 of "What Is Linear Programing . . . and How Do You Put it to Work?" by John E. Chenevey which appeared in the Mar.

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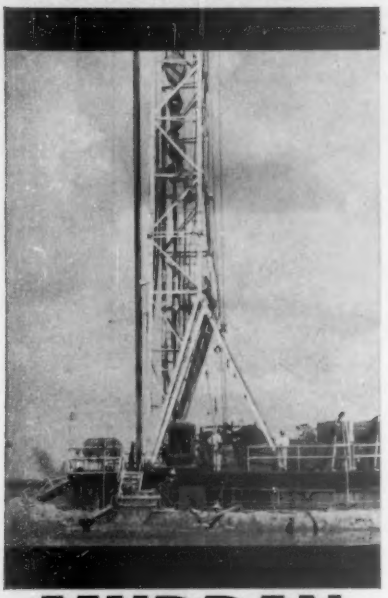

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DIAL DOWELL

7 (p. 113), Mar. 21 (p. 108), and April 4 (p. 114) issues.

May I take this opportunity to compliment you on the timely articles appearing in your magazine. Mr. Chenevey's article is only one of the many we've found both interesting and informative in The Oil and Gas Journal.

Linda Kopell
Research Assistant
Lybrand, Ross Brothers,
& Montgomery
New York

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

APRIL

25-28	American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.
25-29	American Welding Society, annual meeting and welding exposition, Los Angeles.
27-29	Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.
28-29	American Petroleum Institute, Division of Transportation, pipeline conference, Mayo Hotel, Tulsa.
28-29	Pacific Coast Gas Association, distribution conference, Benson Hotel, Portland.
28-May 1	Mississippi Geological Society and Society of Economic Paleontologists and Mineralogists, Gulf Coast section, field trip to coastal Mississippi and southwestern Alabama.
29-30	Mississippi Academy of Sciences, Inc., Millsaps College, Jackson, Miss.
30	Geological Society of America, Rocky Mountain section, Black Hills area field trip.

MAY

1-3	Texas Independent Producers and Royalty Owners Association, fourteenth annual membership meeting, Holiday Inn, Carlton and Blackstone Hotels, Tyler, Tex.
1-4	American Petroleum Institute, Division of Transportation, tanker conference, Seaview Country Club, Absecon, N. J.
2-3	Society of Petroleum Engineers of AIME, North Texas section, fourth biennial secondary recovery symposium, Wichita Falls, Tex.
4-6	Society of Petroleum Engineers of AIME, Rocky Mountain sections, and Canadian Institute of Mining and Metallurgy, petroleum division, joint meeting, Palliser Hotel, Calgary.
9-12	American Petroleum Institute, Division of Refining, midyear meeting, Statler and Sheraton-Cadillac hotels, Detroit.
9-12	Instrument Society of America, instrument-automation conference and exhibit, Civic Auditorium and Brooks Hall, San Francisco.
9-13	American Gas Association, distribution and transmission meeting, Jung and Roosevelt hotels, New Orleans.
11-12	University of Kansas, gas conditioning institute, National Guard Armory, Liberal, Kans.
11-14	Fluid Controls Institute, spring meet-

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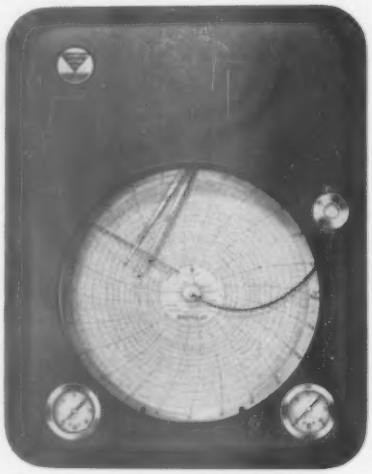

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12-13 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

12-14 Kansas Independent Oil and Gas Association, annual meeting, Lassen Hotel, Wichita.

13-14 Southern Methodist University, School of Engineering, advanced technology seminar on heat transfer in electronics and direct conversion of heat to electricity, Dallas.

16-17 International Society of Professional Well Log Analysts, first annual meeting, Tulsa Hotel, Tulsa.

18-20 American Petroleum Institute, Division of Marketing, midyear meeting, Statler-Hilton Hotel, Cleveland.

22 Pennsylvania State University, short course in reservoir engineering, University Park, Pa. Term ends June 10.

22-26 Air Pollution Control Association, annual meeting, Netherland-Hilton Hotel, Cincinnati.

23-24 American Gas Association, production meeting, Roosevelt Hotel, New York City.

23-26 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Muehlebach Hotel, Kansas City.

24-25 Western Petroleum Refiners Association, computer conference, Ben Milam Hotel, Houston.

24-26 American Right of Way Association, annual seminar, Shoreham Hotel, Washington.

25-27 Pacific Coast Gas Association, accident prevention and transmission conference, Hotel Utah, Salt Lake City.

25-28 American Association of Petroleum Geologists, western Canada regional meeting, Banff Springs Hotel, Banff, Alta.

26-27 Natural Gas and Petroleum Association of Canada, meeting, Niagara Falls, Ont.

JUNE

1-3 Texas College of Arts and Industries, fifteenth annual short course on gas technology, sponsored by Southern Gas Association, Kingsville, Tex.

1-3 West Virginia University, fifth annual Appalachian underground corrosion short course, Morgantown, W. Va.

2 Pennsylvania Grade Crude Oil Association, annual meeting, Pennhills Club, Bradford, Pa.

2-3 Kentucky Oil and Gas Association, annual meeting, Phoenix Hotel, Lexington.

5-9 American Society of Mechanical Engineers, summer annual meeting, Dallas.

5-10 Society of Automotive Engineers, summer meeting, Edgewater Beach Hotel, Chicago.

9-11 Manufacturing Chemists' Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

13-15 American Association of Cost Engineers, annual meeting, Rice Hotel, Houston.

13-15 Chemical Institute of Canada, annual conference and exhibition, Chateau Laurier, Ottawa.

13-15 Interstate Oil Compact Commission, midyear meeting, Statler Hilton Hotel, Detroit.

15-16 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Hotel Lassen, Wichita.

19-22 American Institute of Chemical En-

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gineers, Instituto Mexicano de Ingenieros Quimicos, joint meeting, Hotel Del Prado, Mexico City.

22-25 Canadian Gas Association, annual meeting, Manoir Richelieu, Murray Bay, Quebec.

22-25 American Association of Petroleum Landmen, national convention, Ambassador Hotel, Los Angeles.

25-29 Petroleum Equipment Suppliers Association, annual meeting, Banff Springs Hotel, Banff, Alta.

25-July 5 First International Congress for Automatic Control, Moscow, U.S.S.R.

26-28 North American Gasoline Tax Conference, annual meeting, southern region, Eden Roc Hotel, Miami Beach.

26-July 1 American Society for Testing Materials, annual meeting and exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J.

27-28 Michigan Gas Association, Mackinac Island, Mich.

JULY

28-30 American Petroleum Institute, Division of Production, Eastern district meeting, The Greenbrier, White Sulphur Springs, W. Va.

AUGUST

3-5 Wyoming Geological Association, field trip to Snyder basin and Wind River Mountains, Casper.

14-19 National Congress of Petroleum Retailers, Inc., annual session, Shamrock-Hilton Hotel, Houston.

15-17 American Society of Mechanical Engineers, American Institute of Chemical Engineers, heat transfer conference and exhibit, Statler Hilton Hotel, Buffalo, N. Y.

15-26 Sacramento State College, summer institute on nondestructive testing, Sacramento, Calif.

22-26 Gordon Research Conference, catalysis, Colby Junior College, New London, N. H.

29-31 Appalachian Gas Measurement Short Course, University of West Virginia, Morgantown, W. Va.

SEPTEMBER

6-7 Chemical Institute of Canada, organic chemistry division conference, Edmonton.

7-9 American Society of Mechanical Engineers, joint automatic control conference, Massachusetts Institute of Technology, Cambridge, Mass.

8-9 National Research Council, Chemical Institute of Canada, tenth Canadian high polymer forum, Alpine Inn, Montreal.

8-10 Chemical Institute of Canada, western regional conference, Regina.

11-16 American Chemical Society, national meeting, New York City.

14-15 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

14-16 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

Natural Gasoline Association of America, Rocky Mountain regional meeting, Palliser Hotel, Calgary.

-21 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Jung Hotel, New Orleans.

19-21 Texas Mid-Continent Oil and Gas Association, annual meeting, Hilton Hotel, San Antonio, Tex.

21-23 Pacific Coast Gas Association, annual meeting, Westward Ho Hotel, Phoenix.

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Photo courtesy of Freeport Sulphur Co. and Sikorsky Aircraft.

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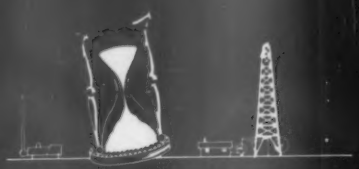


the Journal said...

50 years ago

April 20, 1910

A party of Standard Oil Co. officers and directors headed by John D. Archibold, vice president from New York, is touring refining and other oil properties in Louisiana, Oklahoma, Kansas, and Illinois. First point of interest was the company's newly completed refinery at Baton Rouge. On the way from Shreveport to Muskogee and Tulsa, the party, traveling in special Pullmans, stopped at Lewis station, where horses and buggies awaited for a ride around the active Vivian shallow oil development in the Caddo district.

Fire, resulting from a gas explosion, completely destroys the canning plant at The Texas Co.'s Port Arthur refinery. Total loss is estimated at more $100,000 plus 15,000 cases of oil.

25 years ago

April 25, 1935

Humble Oil & Refining Co. sets a new producing depth record in Texas. It completes its 1 Danielson well at Dickinson field, southeast of Houston in Galveston County, flowing 31 bbl. of oil per hour through ¼-in. choke from a 9,140-ft. sand. Previous deepest production in the state was from an 8,700-ft. zone at Big Lake, in Reagan County, West Texas.

Arkansas offers a cash bonus of $1,000 to be paid for the discovery of any new field, on new productive horizon in any known field in Union, Miller, Columbia, Nevada, Ouachita, or Lafayette counties. A discovery in any other county of the state will draw $5,000.

Colorado Legislature ratifies interstate oil compact, joining Oklahoma, Texas, New Mexico, and Kansas in the new oil and conservation effort.

10 years ago

April 27, 1950

Sinclair Petroleum Co. (Sinclair Oil & Gas Co. affiliate) abandons its 1 Gumburo wildcat in the Ogaden desert wilderness of southeastern Ethiopia. The test, Ethiopia's first, has been one of the world's toughest wildcats. After drilling more than a year, it was dry at 10,000 ft. Location is more than 250 miles from nearest civilization at Dire Dawa.

Tennessee Gas Transmission Co. reveals plans for one of the world's largest gas-processing plants to be built near Greensburg in Western Kentucky. The $12,000,000 plant will process gas passing through the company's main line. It will extract and recover ethane, propane, butane, and natural gasoline to the tune of 400,000 gal. daily from capacity throughput of 600 M.M.c.f. of gas daily.

JOURNALLY SPEAKING

The OGJ Oil Co.

OUR STAFF had a lot of fun making like a big oil company trying to find oil the most efficient way.

True to the spirit of the times, our exploration department set out to develop a cost-cutting device, and it came up with one it considers a dilly—the montage method.

Pete Bike, its sponsor, wouldn't tell us much about it because he didn't want this department to scoop his major opus which starts on page 127 of this issue.

As near as we can figure out after rigorous crossexamination of Pete, this really isn't so much a means of finding oil as a means of prying a drilling appropriation out of the board of directors.

But, we are solemnly assured, that is the big problem of geologists these days. Geologists know they can find plenty of oil if only their tight-fisted bosses would give them the wherewithal in the form of adequate mazoola. It seems that geologists are the bold, imaginative, optimistic type, whereas the top brass can't see beyond the edge of the desk when it comes to turning loose any of the stockholders' money.

Hence this montage method, which is guaranteed to loosen the purse strings of the most hard-boiled board of directors. At least it worked perfectly on its trial run.

You can see the method in action in the picture on the opening page of the article. That's the board of directors of the OGJ Oil Co. in session to evaluate a drilling prospect. The directors were selected from staff members whose profiles were thought to resemble those of penny-pinching treasurers, comptrollers, bankers, and similar barnacles on the ship of geological progress—or maybe it was just what could be rounded up during a coffee break.

At any rate, there's the board in session, and up front with the pointer is the head of our exploration department, Frank Gardner, expounding the attractions of a hot drilling prospect his staff has uncovered.

Only instead of taking up hours of the board's time by laboriously displaying one confusing chart after another, he is using the montage method which gives the whole thing at a glance and so simply that even the most unexploration-minded nickel nurser will buy it in a hurry.

It worked swell with the OGJ Oil Co. In no more time than it took the photographer to snap the picture, our board of directors voted unanimously to break the lock off the cash box and spud in Journal No. 1 immediately if not sooner.

After all this was explained to us we voiced the supposition that the brass of a company presumably interested in finding oil would take the time necessary to study data assembled by its geologists in whatever form and without the need for such an instant-decision gimmick. But we were told that shows how little we know about big executives; that they are very busy men and have to have things explained to them in A-B-C fashion.

Okay, okay. So if your brass is that kind, you may want to try the montage method. There are several pages of pictures that show how the OGJ Oil Co. did it. They were arranged by our art director, Dudley Johnston, and he managed to get himself in focus a couple of times.

But, being a real savvy art director, Dud wisely featured his cute blond assistant, Jo Jeanne Speaker. Take a look at Jo Jeanne. (You would anyway, without us telling you to.) She's everything the pictures show her to be, including left-handed.

This being our special exploration issue, you will also want to take a good look at some of the other features. For instance, there's a powerful piece about plant pollen—not the fresh kind that gives you hay fever, but the fossilized kind that gives you oil fever.

And then there's our perennial best seller, the geological correlator, brought up to date in a new and revised edition. It's a wall-chart insert, so if you don't find it, blame somebody up the routing list on your magazine.

(At this point we should put in a commercial about how you should have your own subscription so you won't miss things like this, but the circulation manager won't give us any payola so we're not even going to mention it.)

—Henry D. Ralph.

Making hole faster—Gardner-Denver's

2100 horsepower

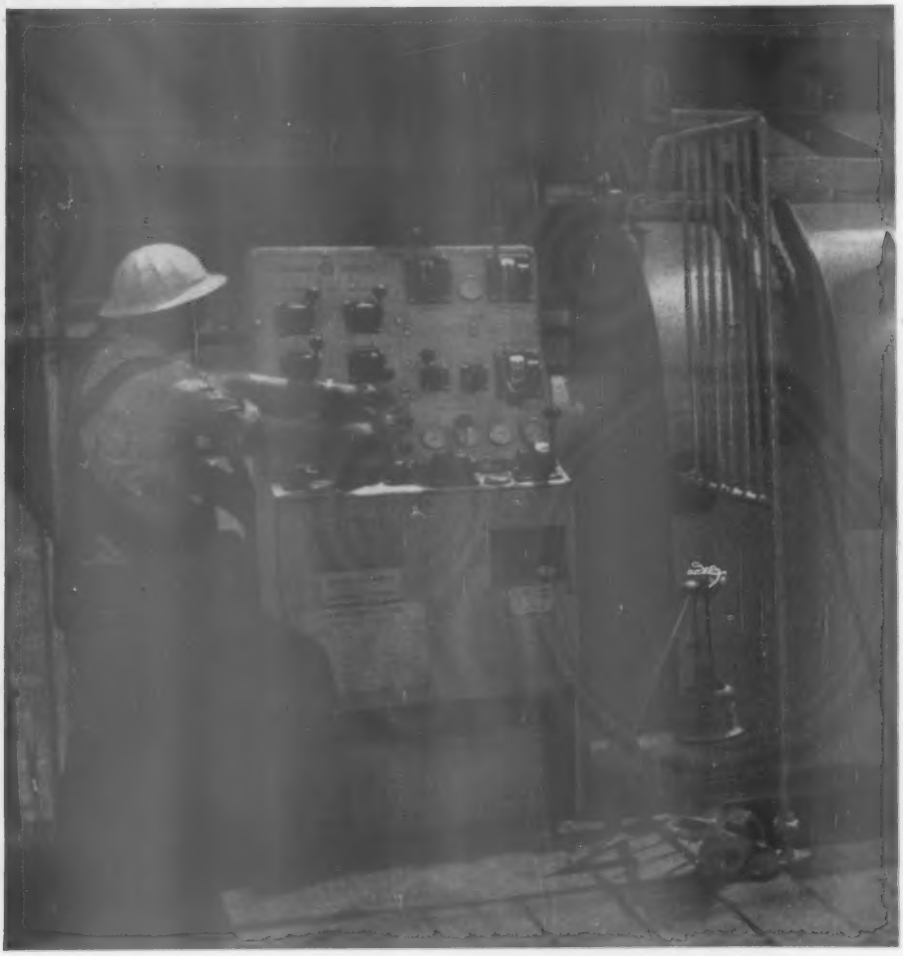
One-piece construction

Air-actuated controls

Ample braking power

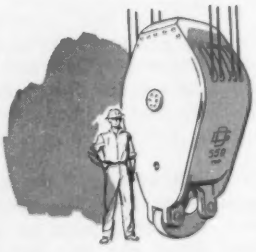
Eight hoisting speeds

Four rotary speeds—two reverse



Word is getting around that the smooth-running Gardner-Denver "2100" handles bigger loads at higher speeds . . . has the power and stamina of a giant. If your next well is a deep one—15,000′ on down—get the facts on the "2100". Call your Gardner-Denver oil field specialist.

WHAT'S NEW AT GARDNER-DENVER?



Matched component equipment for the Gardner-Denver "2100" drawworks: crown block, traveling block, swivel, rotary table, compound. Also a new 1500 hp drawworks and matched component equipment.

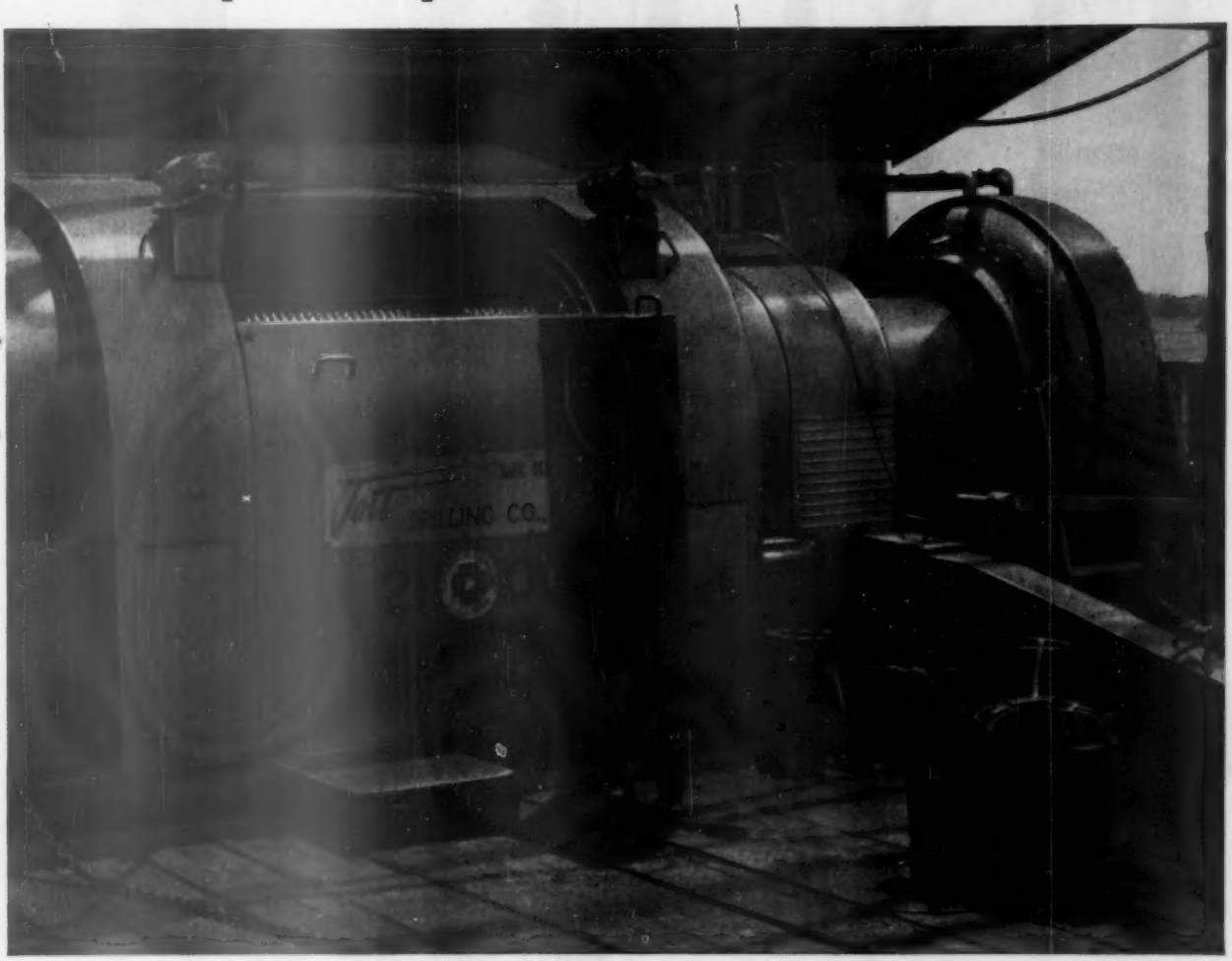
Here's what you get . . .

More Than 130,000-lb. single-line pull

One-piece construction—hoist and transmission contained on one frame and housing. By disconnecting only one chain, drawworks separates from compound . . . no internal air or oil lines are disturbed.

36″ x 60″ drum core—total capacity: 4100′ of 1½″ drilling line.

new power-packed "2100" drawworks



Ample braking power—60" x 12" brake rims. Self-energizing, 330° wrap brake bands with tension-type equalizer. Water-jacketed, demountable brake rims.

Air-actuated clutches—high-capacity PO type Twin Disc triple-plate air clutches provide compact torque transmission . . . smooth power flow.

Easy-to-use controls—air-actuated control valves mounted on compact control panel in logical operating sequence. All are prominently marked for quick, easy accessibility.

Compact transmission—eight forward drum speeds, two reverse . . . four forward rotary speeds, two reverse. Specially designed interlocks prevent locking up in more than one forward speed or driving simultaneously in forward and reverse.

SPEED SPECIFICATIONS

SPEED	LINE SPEED	LINE PULL
1	422	131,500
2	585	94,750
3	820	67,600
4	1140	48,700
5	1530	35,500
6	2120	26,200
7	2940	18,850
8	4100	13,400

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

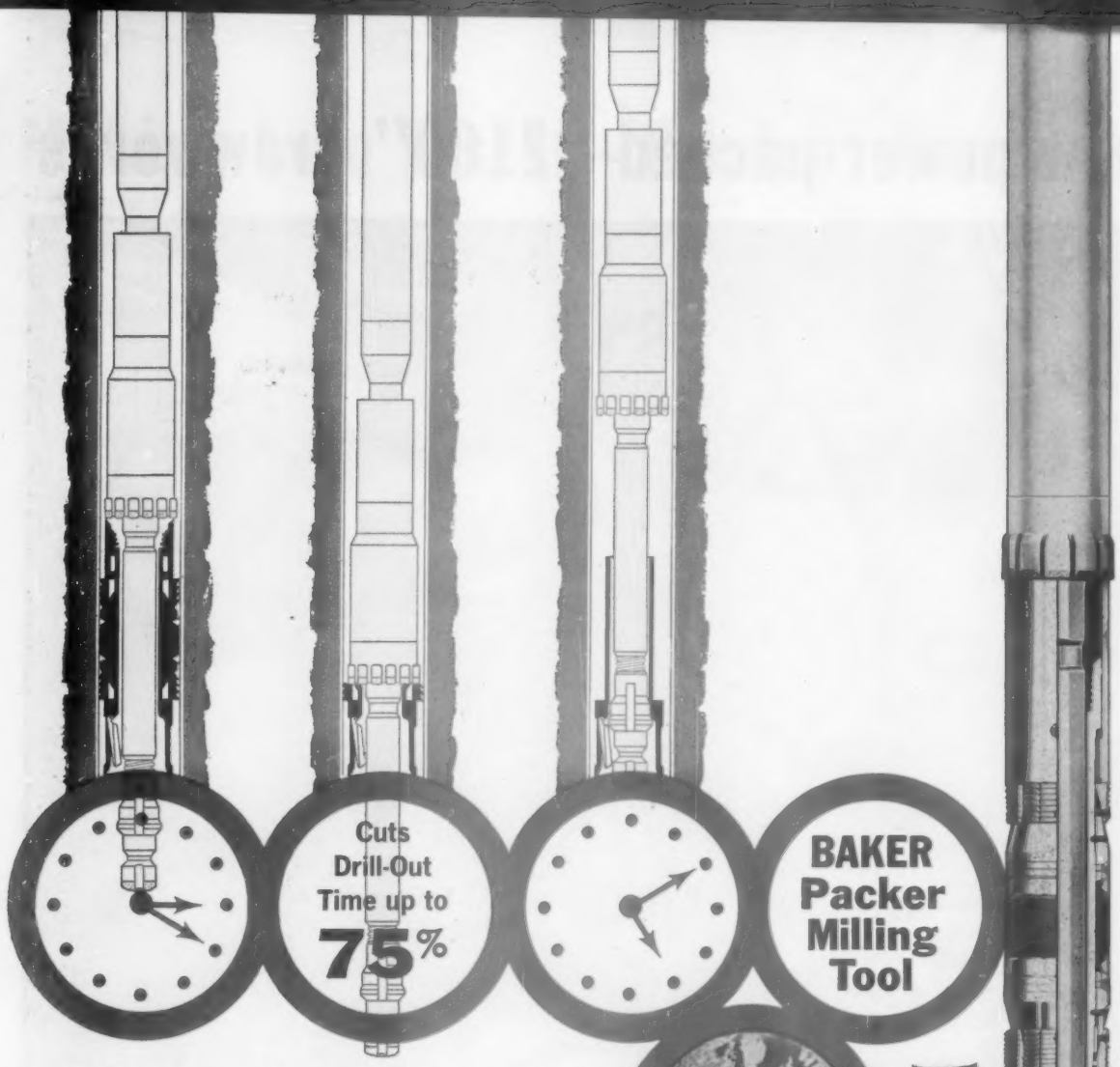
GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario

Gardner-Denver International Division, 233 Broadway, New York 7, N.Y.

Petroleum Offices: Casper, Cleveland, Columbus, Corpus Christi, Dallas, Denver, Durango, Edmonton, Ellinwood, Evansville, Houston, Huntington, Jackson, Kansas City, Lafayette, Los Angeles, Mexico City, New Orleans, Odessa, Oklahoma City, Pittsburgh, San Francisco, Shreveport, St. Louis, Tulsa, Wichita, Winnipeg



THAT'S RIGHT... rock bits require 8 to 16 hours to drill-out drillable Production packers—but the new Baker Packer Milling Tool does the job in 2 to 4 hours.

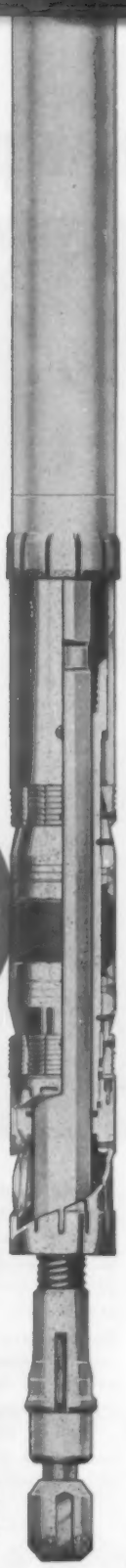
Why does this new tool reduce the time so drastically? Because Baker engineers designed it to perform this one job efficiently. It is not an all-purpose milling tool. Hence, it does not mill up the entire packer, but *only* those elements that hold the packer in a set position against the casing.

Another important factor is the sustaining, self-sharpening action of the milling shoe and bottom sub. These cutting areas are dressed with special Baker Milling-Carbide Compound. Hundreds of carefully selected carbide chips are bonded in a matrix, and so distributed that an efficient milling action is always maintained.

During milling the tool is stabilized in the casing by its lower portion which rotates inside the packer body. A simple spring-loaded *catch sleeve* expands below the packer so that when the tool is retrieved, the remaining portion of the packer can be brought to the surface. This catch sleeve also provides a positive emergency release.

In addition to Baker production packers, the milling tool may be used for other drillable packers of similar design. It is available domestically on a low-cost rental basis, through your experienced Baker Serviceman—ask him for complete information or write for Catalog Supplement No. 353.

Set at 19,425 feet in 7-inch casing, this Retainer Production Packer was milled over in two hours and fifty minutes, and the cast-iron body and bottom of packer retrieved without damage to 4½-inch liner just below it.



PRODUCT NUMBER 747-C

BAKER OIL TOOLS, INC. • **HOUSTON** • **LOS ANGELES** • **NEW YORK**

What's a fair share of the crude market?

HOW MUCH is any state's "fair share" of the national market for crude oil?

This question is being argued vehemently these days, and many producing areas are accusing others of encroaching on their normal and rightful markets for crude.

Some high-explosive ammunition for this battle is contained in a series of tables in this issue of the Journal. They show interstate movements of crude in recent years and reveal significant shifts in the chief supply sources for various refining areas.

BUT DON'T JUMP TO CONCLUSIONS from these statistics. They show results, not causes. There are many factors other than historical patterns that bear on a state's fair share of the market.

With today's network of transportation facilities, and when producing capacity exceeds requirements, competition for crude markets is open and intense. A barrel of oil produced almost anywhere may crowd against other crude. The market is national rather than local, and no producing area can be secure in a "natural" market.

To determine what is a fair share for any producing area involves a complicated weighing of such factors as reserves, discovery rate, drilling incentives, producing capacity, production and transportation costs, types of crude, and market preferences.

There may never be complete agreement on the exact proportion of the national market that any individual state should have. But there are some general principles of fairness that could serve as a guide.

In the first place, new oil is entitled to a market, else exploration will cease. Yet new oil should not expect all the market, and there is a limit to the extent that older sources need move over to make room for it.

In the second place, conservation of natural resources requires some protection for stripper fields and marginal properties (assuming that the marginal producers are operated as efficiently as possible in the light of current technology).

STATE REGULATORY BODIES have more responsibility to foster the expansion and protection of underground reserves than to try to force the market to absorb more of the state's current production than refiners want at any particular time.

This calls for more and better proration—proration in states not now practicing it, and improved formulas in prorating states so that what market is available is divided equitably among wells within the state.

The figures on shifts in crude movements emphasize again the need for all states to modernize their conservation laws to fit current technology and economics, to improve equity, and to increase the industry's efficiency.

Nickel alloy steel sucker rods kept this crew from going fishing

When a subsurface pump jammed, this crew had a pulling job to do. But that was all! No costly, time-consuming fishing was needed.

Why not? A simple but important reason: because the sucker rods were made of nickel steel, they were able to take the wrench of jamming without parting . . . *even though they were already carrying a heavy load.*

When pumping deep wells at excessive loads, nickel alloy steel sucker rods have demonstrated outstanding strength along with high fatigue resistance. When pumping corrosive wells, they have demonstrated, as well, a resistance to corrosion and corrosion-fatigue that adds many valuable pumping hours before replacement is necessary.

The tough jobs go to nickel alloy steels

Because of their performance record, producers depend on nickel alloy steels for long, reliable service — particularly in equipment where better than ordinary mechanical properties and corrosion resistance are needed.

Do you have an equipment problem involving a need for materials with greater strength and toughness without increase in weight . . . resistance to corrosion . . . better response to heat treatment? Let us know about it. We'll be glad to help you find the answer.

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street New York 5, N. Y.

INCO NICKEL

NICKEL ALLOYS PERFORM BETTER LONGER

FPC Probe Could Become Explosive

• Whatever happens, gas men will find the going tougher. Big changes on the commission could result from politics and publicity. What worries gas men is probable further delay in decisions while FPC members defend themselves.

Clyde La Motte
Washington Editor

THE CURRENT congressional investigation of the Federal Power Commission could have far-reaching effects, not only upon the commission itself but upon the industry it regulates.

It could result in wholesale replacement of commissioners.

It may spur legislation further restricting industry contacts with the commission.

Conceivably, it could add momentum to a drive to overhaul drastically all independent governmental regulatory agencies, perhaps to the extent of stripping them of many of their functions.

And certainly it will have a public-relations impact, especially so if the widespread publicity now being given the investigation causes the general public to feel that big gas companies have been able to sway FPC decisions—with the gas consumer ultimately paying through the nose as a result.

The very least that could happen would be to make the FPC more cautious in its dealing with industry, probably to the extent of going out of its way to prove that it is not "controlled" by gas firms.

The fact that this is a political year may tend to keep the issue alive, giving foes of the administration opportunity to charge that the FPC probe has provided added proof that the consumer's interests are not being adequately protected.

Politically, a great deal depends on whether further "irregularities" are uncovered and whether some hotter issues crop up elsewhere to draw the spotlight away from the FPC.

How the fuss started

The current uproar involving the FPC began over the commission's handling of the Midwestern Gas Transmission Co. case last fall.

In October, the FPC held hearings on Midwestern's application for a certificate of necessity to permit it to build a pipeline to serve the Midwest with natural gas from Canada.

Time was a factor because unless a decision was given before November 1, Midwestern would face the task of renegotiating its supply contracts.

Another major factor was the question of a rate of return. Midwestern pressed hard for a 7% rate while the FPC staff recommended a return of 6¼%.

On October 31, 11 days after the hearing ended, the FPC decision was announced: The certificate was granted (provided Canada approved an export license). The rate of return was left unsettled, the commission

JEROME K. KUYKENDALL

WILLIAM R. CONNOLE

Three FPC members on the spot

These are the FPC commissioners who will be asked to explain their dealings with Thomas G. Corcoran, who represented Midwestern Gas Transmission Co. in its application for a certificate of necessity to permit it to build a pipeline last fall. It was in the handling of this application that the alleged irregularities which will be investigated were committed.

The commissioners also may be asked to explain favors received from gas companies with cases pending before the commission.

ARTHUR KLINE

saying it would make that decision later, along with some other unsettled points.

On the surface, all this appeared routine. But a veteran Washington oil reporter, Joe Huttlinger, got a tip that some funny business may have taken place.

According to Huttlinger's tipster, the commission had originally accepted the staff's recommendation of a 6¼% rate of return and an order had been drafted to that effect.

But, Huttlinger was told, before the order was issued, a copy of it was "leaked" to a representative of Midwestern who promptly hurried to the commission and talked privately—and separately—with three members of the commission. They were Chairman Jerome Kuykendall, Arthur Kline, and William R. Connole.

The implication was clear: The representative had been able to persuade a majority of the commission to change the original order to eliminate the 6¼% provision and to substitute the "open end" provision which would give the company further opportunity to try to justify a 7% rate.

The Midwestern representative, the reporter was told, was none other than Thomas G. Corcoran, widely known in the Roosevelt-Truman days as Tommy the Cork, a man with considerable influence in Washington.

Huttlinger, who has a reputation as a fair, accurate reporter, checked all this with FPC Chairman Jerome Kuykendall.

Kuykendall readily admitted that he had talked with Corcoran, but implied that the conversation had not dealt with the key issues of the case. As for the reported leak of a drafted order, the chairman said he would investigate. (He later said the investigation was "inconclusive.")

Huttlinger wrote his story in November but it didn't create much of a stir at the time, especially since the general press did not pick it up. However, it apparently did prompt Kuykendall to go to Rep. Oren Harris (D.-Ark.), chairman of the Legislative Oversight subcommittee, to tell Harris about the "incident."

Congressional probe

The case broke into the open in March when the Harris' Legislative Oversight Committee (which has been investigating "influence" in Washington) called Kuykendall to testify on some pending legislation involving regulatory agencies.

At this hearing, Kuykendall not only said that he had talked to Corcoran but conceded that a telephone call from Corcoran had constituted an ex parte communication because it dealt with an issue in the case—the rate of return.

Kuykendall emphatically denied, however, that Corcoran had caused the commission to change its Midwestern order.

Kuykendall said the commission couldn't have changed its order because the order hadn't been written at the time. He did say there had been a tentative draft calling for a 6¼% rate of return but that this had been written by the commission staff at Kuykendall's direction merely to give the commission a specific order to consider. There was nothing unusual—or improper—about this, Kuykendall said, Corcoran couldn't have persuaded him to change his mind and oppose a 6¼% rate of return because he (Kuykendall) had not favored this rate in the first place.

Even so, Kuykendall's admission that there was an ex parte communication from Corcoran in the final stages of the case was enough to cause many newspapers to play the story on page one.

Subsequently, it was decided that a further hearing would be held by the full House Commerce Committee, beginning May 2, to go further into that issue, and others. Corcoran is scheduled to appear at that time to tell his side of the story.

What lies ahead

The committee hearing May 2 very likely will set the pattern for what is to follow. Many observers feel that while the evidence thus far revealed may tend to be embarrassing to the commission, it is not sufficient to create any major upheaval.

However, with the spotlight now on the case, the fat will really be in the fire if there is any substantial evidence introduced indicating that the commission has displayed poor ethics—or even that it has used poor judgement on too many occasions.

It is known that questions will be asked about reports that Corcoran interceded privately with the commission on an earlier action involving Midwestern.

And there will be an effort to determine whether or not it is a common practice for pipeline-company representatives to communicate ex

What the fuss is about

THE HEART of the issue in the FPC probe is whether some or any commissioners have been "influenced" in their decisions by private contacts with representatives of companies with cases before the commission.

Too, there is the question of whether some commissioners have accepted favors from gas companies, the implication being that such favors may have obligated them.

Another key question is the extent of abuse, if any, made of ex parte communications. "Ex parte" is simply a lawyer's phrase covering a situation in which one side is permitted to make a plea or present evidence privately without the other side knowing about it or being given a chance to present its own views on those points.

Ex parte communications become particularly important if they occur after the commission has completed hearings on a case and before it hands down its decision, for at this stage the commissioners take on the role of judges to ponder the evidence before them.

The issue really becomes explosive if there is any indication that a principal in a case learns in advance of an upcoming ruling and is then able, through private contacts, to get that decision reconsidered.

Part of the trouble with ex parte communications is that it is difficult to draw the line on when and how they should be permitted and when they should be banned entirely.

Ex parte communications can be entirely proper and useful, even essential. This is particularly true if the communication merely concerns a procedural matter or helps clarify some point. Just as obviously, it would appear the commissioners would refuse to accept ex parte communications made in a last-minute effort to change an order already decided upon.

In between those extremes lies a gray area where common sense, good judgment, and ethical standards have to be used as yardsticks, because it would be impossible to legislate rules for every action of a member of the commission or the industry.

parte with commissioners or staff members while cases involving their companies are being considered.

Also, the committee is certain to inquire about various "favors" the commissioners may have received. It has already been made public that a gas company used its own plane to fly Kuykendall and two other commissioners to Louisiana for the funeral of John Hussey, who at the time of his death was a member of the commission. A similar incident occurring at the death of another commissioner several years ago may also be aired.

Enough of this sort of thing, with the attendant publicity, could cause a commissioner to feel forced to resign, feeling that his usefulness had been impaired. Or it might prompt the Administration, which has campaigned in the past on "clean government," to request resignations.

Also, in a sense, the pipeline companies themselves will be on trial, too. For if it is demonstrated that some have used pressure, "inside" contacts, politics, or favors to obtain advantageous decisions, serious repercussions could result.

More than any dirt that might be dug up, the industry fears that the probe will slow still further FPC's processing of cases.

Certificate applications involving hundreds of millions of dollars are now pending before the commission. Action will be necessary soon if projects scheduled for completion this year are to meet contract deadlines.

What worries producers, pipelines, and their customers is this: FPC members can't be answering questions before a congressional committee, with their careers perhaps hinging on the outcome, and passing on complex certificate and rate cases at the same time.

Unquestionably, a great deal is riding on the outcome of that May investigation.

Gas Confusion Created by Congress, Not FPC

• And if Congress doesn't heed FPC warnings and modernize the law, it will take 10 times the present staff to catch up on the work load, Kline says.

THE NATURAL-GAS industry is in a condition of confusion and chaos, but the fault lies much more with Congress than with the Federal Power Commission, in the view of Commissioner Arthur Kline.

FPC has done a good job of regulating the industry, considering the tools provided for the task assigned. It has kept the supply of gas flowing by expediting certificate cases.

It has stabilized field prices to a certain extent. And it is making much progress in simplifying its administrative procedures.

True, it has not found a way to regulate producers' prices, after nearly 6 years of trying. And it does have a tremendous backlog of undecided rate cases, both producer and pipeline, and this condition is steadily getting worse.

But unless Congress revises the law as repeatedly requested by FPC, a staff 10 times as big as the commission now has would be required to bring the work up to date.

Kline, vice chairman of the commission, was addressing the annual conference of accountants at the University of Tulsa. But instead of discussing accounting problems he used this forum to defend the commission against the many attacks that have been made on it.

The other side . . . Congress is currently investigating FPC (see p. 97). Congressmen make statements that FPC is not doing its job.

Consumers complain that it is not protecting the public interest. Writers charge that it is responsible for the unsettled condition of the gas industry. But nobody tells FPC's side of the story.

The underlying causes of the trouble, according to Kline, are that FPC is trying to follow an inappropriate formula for regulating producers' prices, and that the 1938 law is no longer suitable for regulating gas pipelines.

No standard has yet been set for judging producers' prices because FPC felt it must proceed case by case, at least at the start. And the problem is so complicated that only one case—Phillips—is yet ready for commission action. Kline explained that Commissioner Hussey's death so set back the commissioners' work that a decision in the Phillips case may not be reached for another 2 months.

Share the blame . . . FPC has repeatedly asked Congress to change the law regarding producer regulation, and argued for it "until we are hoarse," said Kline.

But the law needs many changes as to regulation of interstate pipelines, he stressed.

Court decisions have unduly complicated FPC's work, largely because the cases appealed were not typical of conditions generally prevailing in the industry, and because the courts did not always get the whole story. Kline admitted that FPC itself may be partly to blame for this. The commission's decisions have not always been sufficiently clear, explicit, and detailed to permit proper court review.

The gas industry has changed tremendously since the law was passed. There are dozens more pipeline companies, and the volume of gas and the number of customers is manyfold greater than 10 years ago.

Rate cases are far more complicated than they used to be, and more and more people are interested in them.

Gas companies are diversifying into many lines of business which are unregulated. FPC must allocate costs to see that only a fair share of the overhead goes into the rate base for gas prices.

Most long lines now have zone rates, and the customers in each zone argue interminably over FPC's attempts to allocate costs and rates among the zones.

These are just some examples of the compounding difficulties facing FPC in trying to keep abreast of its regulatory job. In Kline's view, it can never catch up unless Congress gives it some relief.

Shortcuts tried . . . FPC is experimenting with short cuts to speed up its procedure. But some of them may be illegal, and thrown out if taken into court.

The commission needs legal authority to streamline its operations, limit the number of intervenors, expedite hearings, and eliminate unnecessary procedural steps.

It also needs enactment of the many amendments to the law it has requested year after year in its annual reports—changes in the pipeline sections of the law as well as in the producer section.

As to producer regulation, FPC has been charged with advocating complete exemption of producers. That, in Kline's personal view, might be a satisfactory answer. But the commission will settle for any sort of producer regulation that promises to be administratively workable and will relieve FPC of its present impossible task.

Where Domestic Crude Moves Within the U. S.

Exports to other states, in thousands of barrels daily.

ROCKY MOUNTAINS: Shipments up.

(Figures include Colorado, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming)

	1954	1955	1956	1957	1958	1959
DISTRICT 1						
N.Y. (West)	...	...	2.8	8.3	8.4	3.6
Pa. (West)	...	...	...	...	...	3.0
Total	...	...	2.8	8.3	8.4	6.6
DISTRICT 2						
Ill.	40.1	41.3	46.1	51.7	61.8	59.4
Ind.	81.4	84.1	99.1	121.3	137.4	143.0
Kans.	1.3	11.5	25.6	23.9	14.0	15.0
Mich.	22.1	33.3	47.6	47.6	48.8	52.2
Minn.-Wis.	18.1	15.0	8.2	8.9	10.0	15.0
Mo.	4.2	7.3	11.2	10.2	7.7	4.7
Neb.	1.5	1.9	2.1	2.2	2.5	2.5
Ohio (East)	1.1	1.6	3.5	1.3	...	0.7
Ohio (West)	12.2	21.1	22.5	24.3	18.8	19.7
Okla.	...	...	...	...	3.7	20.7
Total	182.0	217.3	265.9	291.4	304.8	332.9
DISTRICT 3						
La.	...	...	...	...	2.6	1.2
N. Mex.	...	0.4	0.1	0.1	...	...
Texas	...	...	...	...	7.2	9.7
Total	...	0.4	0.1	0.1	9.8	10.9
DISTRICT 4						
Colo.	17.7	19.0	20.0	23.2	24.5	30.2
Mont.	31.4	32.3	40.0	39.8	42.0	46.7
Utah	66.9	70.8	78.5	76.2	69.5	69.8
Wyo.	1.8	3.0	4.6	6.2	7.1	6.6
Total	117.8	125.1	143.1	145.4	143.1	153.3
DISTRICT 5						
Calif.	...	...	...	0.4	18.4	33.4
Ore.-Wash.	...	...	...	...	5.6	1.9
Total	...	...	...	0.4	24.0	35.3
TOTAL U.S.	**299.8**	**342.8**	**411.9**	**445.6**	**490.1**	**539.0**
Intrastate	128.8	158.8	160.0	163.2	158.1	175.6

TEXAS: Out-of-state market shrinking.

	1954	1955	1956	1957	1958	1959
DISTRICT 1						
Del.-Mass.-R.I.	6.8	6.2	7.0	45.2	49.1	43.5
Fla.-Ga.-S.C.-Va.	...	...	...	1.3	2.2	0.4
N.J.-Md.	118.8	103.2	122.8	109.8	100.3	106.9
N.Y. (East)	0.7	1.7	2.0	...	...	...
N.Y. (West)	23.5	27.3	25.3	25.2	24.6	23.5
Pa. (East)	197.2	202.7	190.1	202.6	175.0	179.0
Pa. (West)	4.7	3.6	4.2	6.0	8.3	4.7
Total	351.7	344.7	351.4	390.1	359.5	358.0
DISTRICT 2						
Ill.	177.5	211.9	237.5	242.4	254.4	270.5
Ind.	161.5	153.1	137.0	95.1	97.7	93.1
Kans.	32.5	36.4	37.8	18.7	7.6	7.8
Ky.-Tenn.	0.9	1.5	3.9	2.0	...	4.3
Mich.	30.8	32.5	32.6	31.8	26.4	32.1
Mo.	46.4	37.5	42.3	36.9	25.4	20.3
Ohio (East)	2.5	1.7	4.3	3.8	0.8	2.6
Ohio (West	142.1	137.1	156.3	136.1	133.5	127.6
Okla.	48.1	38.2	39.7	41.5	47.2	61.2
Total	642.3	650.5	691.4	608.3	593.0	619.5
DISTRICT 3						
Ala.-Miss.	0.1	0.2	...	...	...	...
Ark.	7.0	7.6	6.9	3.1	0.3	...
La.	121.0	131.3	134.7	108.5	98.0	83.2
N. Mex.	3.2	3.7	3.8	4.2	1.7	...
Total	131.3	142.8	145.4	115.8	100.0	83.2
DISTRICT 4	...	...	...	...	...	...
DISTRICT 5	...	...	...	...	...	...
TOTAL U.S.	**1,125.3**	**1,138.0**	**1,188.2**	**1,114.2**	**1,052.5**	**1,060.7**
Intrastate	1,606.8	1,743.6	1,856.6	1,781.3	1,571.4	1,658.0

EDITOR'S NOTE: In a few cases, interstate shipments of less than 1,000 bbl. daily are not listed in tables. However, these shipments are included in the U.S. and district totals.

SOURCE: Bureau of Mines.

How Domestic Crude-Oil Markets Are

• Journal study shows Texas has made no gains in shipments of oil outside its borders in 5 years, while Louisiana, Rocky Mountains have made big jumps.

INTERESTING changes have taken place in domestic crude markets in the last 6 years.

This is especially true for the last 2 years since the restrictions were imposed on foreign imports.

A new pattern of refinery crude buying has emerged. It is distinguished by two main features:

... **Increased importance** of interstate crude movements.

... **Greater market roles** of crude from Louisiana and the Rockies.

This is a partial explanation for the common complaint of many domestic producers that they aren't enjoying their proportionate share of any increased national production. Truth is they are having to share the market with new production from their own state and also the new production from other areas.

The growing importance of interstate oil movement is shown by these comparative statistics:

From 1954 through 1956, oil shipments between states equaled 68% of the movements within a state. In 1957 this ratio had climbed to 71% and went to 78.6% in 1958. The aver-

LOUISIANA: Moving more crude to Texas.

	1954	1955	1956	1957	1958	1959
DISTRICT 1						
Del.-Mass.-R.I.	14.3	15.1	27.0	17.7	16.7	30.7
N.J.-Md.	50.4	47.3	43.4	55.9	27.3	35.3
Pa. (East)	32.4	37.7	45.1	64.8	49.7	45.6
Total	97.1	100.1	115.5	138.4	93.7	111.6
DISTRICT 2						
Ill.	0.9	1.0	1.0	0.8	0.5	...
Ky.-Tenn.	17.4	15.4	10.8	2.4	0.7	7.8
Ohio (West)	4.9	5.0	2.0	9.7	20.4	44.2
Total	23.2	21.4	13.8	12.9	21.6	52.0
DISTRICT 3						
Ala.-Miss.	...	0.6	...	0.3	0.6	0.9
Ark.	1.0	0.4	1.9	3.7	5.3	2.4
Tex.	167.3	155.7	172.7	195.2	232.9	270.9
Total	168.3	156.7	174.6	199.2	238.8	274..
TOTAL U. S.	**288.6**	**278.2**	**303.9**	**350.5**	**354.1**	**437.8**
Intrastate	369.7	438.8	470.7	445.1	435.5	506.1

NEW MEXICO: Another source for Texas.

	1954	1955	1956	1957	1958	1959
DISTRICT 1	1.9	1.2	...	...	...	0.4
DISTRICT 2						
Ill.	31.5	21.0	29.2	21.4	21.2	12.9
Ind.	1.0	2.4	1.5	13.5	1.8	13.2
Kans.	....	....	...	8.2	12.8	13.7
Mo.	....	....	...	15.1	29.9	28.2
Ohio (West)	....	...	8.0	11.4	8.5	4.1
Okla.	4.1	6.6	2.8	0.6	3.2	2.0
Total	38.4	30.0	41.5	70.2	77.4	74.1
DISTRICT 3						
Texas	134.0	161.8	159.6	154.7	150.2	155.7
Total	134.0	161.8	159.6	154.7	150.2	155.7
DISTRICT 4	....	0.1	...	...	...	0.7
DISTRICT 5						
Calif.	....	...	...	1.1	10.5	20.2
Ore.-Wash.	....	....	...	...	3.4	9.7
Total	...	...	...	1.1	13.9	29.9
TOTAL U.S.	**174.3**	**193.1**	**201.1**	**226.0**	**241.5**	**260.8**
Intrastate	15.7	17.3	20.3	22.0	22.7	24.2

OKLAHOMA: Intrastate movement is up.

	1954	1955	1956	1957	1958	1959
DISTRICT 1						
N. Y. (West)	9.3	4.1	6.8	10.4	7.2	10.7
Pa. (West)	5.6	....	....	....	....	1.1
W. Va.	2.7	0.1	....	....	....	....
Total	17.6	4.2	6.8	11.5	7.2	11.8
DISTRICT 2						
Ill.	63.4	75.7	75.6	67.6	67.0	80.5
Ind.	62.6	66.9	72.9	81.5	74.5	92.2
Kans.	26.4	29.6	30.0	26.2	25.7	26.8
Mich.	10.3	8.1	7.1	5.8	5.5	2.6
Mo.	8.5	14.6	8.0	4.7	9.9	1.9
Ohio (East)	3.8	5.8	12.0	4.5	9.2	5.9
Ohio (West)	47.0	50.9	45.9	50.4	33.1	27.8
Total	222.0	251.6	251.5	240.7	224.9	237.7
DISTRICT 3						
La.	....	...	...	...	....	0.1
Texas	6.6	4.8	4.8	3.4	10.4	9.5
Total	6.6	4.8	4.8	3.4	10.4	9.6
TOTAL U. S.	**246.2**	**260.6**	**263.1**	**255.6**	**242.5**	**259.1**
Intrastate	207.3	239.6	267.8	270.3	259.7	256.8

KANSAS: Moving less interstate.

	1954	1955	1956	1957	1958	1959
DISTRICT 1						
N. Y. (West)	5.6	7.8	6.0	3.5	0.4	0.9
Total	5.6	7.8	6.0	3.5	0.4	0.9
DISTRICT 2						
Ill.	52.1	54.8	42.1	35.8	34.5	31.5
Ind.	54.9	57.7	64.6	73.2	73.9	64.9
Mich.	....	....	....	0.1	1.1	2.5
Mo.	4.9	6.5	6.4	2.0	1.1	0.1
Ohio (East)	8.3	10.0	4.5	3.8	1.3	0.9
Ohio (West)	3.0	0.2	....	....	....	....
Okla.	29.8	32.9	34.4	34.4	31.6	28.6
Total	153.0	162.1	152.0	149.3	143.5	128.5
DISTRICT 3	0.4	2.0	3.0	1.1	....	....
TOTAL U.S.	**159.0**	**171.9**	**161.0**	**153.9**	**143.9**	**129.4**
Intrastate	176.4	173.9	179.6	207.7	227.8	236.1

Shifting

age eased off slightly to 77.3% last year.

What happened in 1958, an "oil recession year," is indicative. Refiners brought in about 22,000,000 bbl. less foreign crude than they did the year before—thanks to import restrictions. They also cut down purchases of crude in states where their plants were located. This cut totaled about 144,000,000 bbl. But the reduction in purchases of interstate crude was only about 1,000,000 bbl.

Crude purchases picked up from all sources in 1959. Refiners showed a little more preference for home-state oil. It showed a larger percentage gain than either imports or interstate crude. But the gain was not enough to restore the ratio of the 1954-57 period.

Actually, interstate shipments of crude to refineries set an all-time record in 1959 when they totaled 1,120,355,000 bbl. The record for oil movement within a state to refineries was established in 1956 at 1,524,400,000 bbl. Refinery receipts of foreign crude were at a peak in 1957 with a total of 365,900,000 bbl.

Some trends . . . Statistics on crude movements through the last 6 years indicate these trends:

. . . **Louisiana** is regaining important markets on the East Coast, has a big new market in the western Ohio region, and is even increasing its oil shipments to Texas.

. . . **Texas** is losing some of its out-of-state business, especially on the East Coast, in the Great Lakes region, and to Louisiana. In addition, it is having to make room for oil shipped in from other states.

. . . **Oklahoma** showed gains in its important Mid-Continent markets but faced a weaker demand at home.

. . . **Kansas,** meanwhile, experienced a slower out-of-state movement.

. . . **The Rocky Mountain region** has become a major factor in supplying the Great Lakes and Midwestern refinery market. There, it runs headon into Oklahoma, Kansas, Texas, and New Mexico suppliers.

. . . **New Mexico** has established an

Where Foreign Crude Is Delivered in the U. S.

(Thousands of barrels daily)

	1954	1955	1956	1957	1958	1959
DISTRICT 1						
Del.-Mass.-R. I.	15.8	19.9	28.8	85.1	60.6	65.2
Fla.-Ga.-S.C.-Va.	11.4	12.8	16.5	33.6	32.3	39.6
N. J.-Md.	264.0	254.7	243.3	220.0	221.5	229.1
N. Y. (East)	26.7	24.5	34.7	35.6	27.0	25.4
Pa. (East)	266.8	326.1	344.6	283.3	301.2	280.0
Total	584.7	638.0	667.9	657.6	642.6	639.3
DISTRICT 2						
Ky.-Tenn.	...	...	...	...	7.2	2.2
Mich.	...	...	4.8	4.2	3.7	5.2
Minn.-Wis.	4.5	14.9	44.6	52.0	55.1	50.7
Ohio (West)	3.1	5.4	5.0	4.9	3.4	0.7
Total	7.6	20.3	54.4	61.1	69.4	58.8
DISTRICT 3						
Ala.-Miss.	2.7	3.7	3.3	2.7	1.4	0.4
La.	1.0	0.4	...	1.9	3.2	2.8
Texas	8.8	26.3	29.3	19.3	39.9	23.6
Total	12.5	30.4	32.6	23.9	44.5	26.8
DISTRICT 4	...	...	...	0.2	0.2	...	...
DISTRICT 5						
Calif.	51.3	60.3	123.8	182.4	128.4	152.1
Ore.-Wash.	...	33.0	55.1	77.2	56.9	82.4
Total	51.3	93.3	178.9	259.6	185.3	234.5
TOTAL U.S.	**656.1**	**782.0**	**934.0**	**1,002.4**	**941.8**	**959.4**

outlet in Texas and the Mid-Continent for its oil shipments out of state.

Greatest impact on domestic oil markets, however, has been made by the production of Louisiana and the Rockies. Both also have enjoyed good increases in oil shipments to their own home refining markets.

The Rocky Mountain region from 1954 to 1959 increased intrastate crude shipments 36.3% from 128,800 bbl. daily to 175,600 bbl. daily. Out-of-state shipments jumped 79.8% from 299,800 bbl. daily to 539,000 bbl. daily, with 60% of this crude going to the Midwest market.

Louisiana during the same period increased its home-state shipments 36.9% from 369,700 bbl. daily to 506,100 bbl., and its out-of-state shipments 51.7% from 288,600 bbl. daily to 437,800 bbl.

By way of comparison, Texas increased its home shipments 3.2% from 1,606,800 bbl. daily to 1,658,000 bbl. and saw its out-of-state shipments decline 5.7% from 1,125,300 bbl. daily to 1,060,700 bbl.

The Texas story . . . Shipments of Texas crude have changed pattern in the past few years. That's true both of crude headed to refineries in other states as well as to the Texas plants.

In recent years, Texas crude moving to out-of-state refineries has averaged roughly two-thirds as much as shipments to plants at home. There are indications now, however, of a trend toward greater use of out-of-state oil by Texas refiners, particularly in the past 2 years.

Crude from other states accounted for 15.5% of all crude moving to Texas refineries in 1955 and 1956. But the next year the out-of-state portion started moving up. It was 16.5% in 1957, and 20% in 1958, and 21.1% of all crude moving to Texas plants in 1959.

A companion trend, meanwhile, has seen volume of Texas crude moving to out-of-state refineries also decline. This has become more acute in the past 2 years. The decrease from 1954 to 1959 amounted to 5.7%; but the average for 1958 and 1959 was down 7.4% from the average for the 1954-57 period.

Part of the decline in these out-of-state shipments of crude has been due to cuts in Texas production which were necessary to give a better balance of crude supply and demand. Texas production has averaged more than a billion barrels per year for 1951-53 and 1955-57. There was a drop below this level in the recession year of 1954 and again in 1958-59.

Texas' greatest loss in its out-of-state shipments has been to states in District 3 where the big drop was in Louisiana. The shipments to Louisiana dropped from 121,000 bbl. daily in 1954 to 83,200 bbl. daily in 1959, a loss of 31.2%.

Movement of Texas oil to East Coast refiners has remained almost stable since 1954, showing a modest 1.8% increase. At the same time a 3.5% drop has been encountered in shipments to the Mid-Continent.

Sales of Texas crude within the state were only 3.2% higher in 1959 than in 1954, which was a recession year. The peak year for oil sales at home was 1956 when the flow of Texas crude to Texas refineries averaged 1,856,600 bbl. daily. The movement was off 285,000 bbl. daily from that peak by 1958. Refinery runs in Texas gained 115,000 bbl. daily in 1959, but a disproportionate part of this gain was taken by crude coming in from other states.

Louisiana expansion . . . Producers in Louisiana have enjoyed a two-way growth since 1954: Increased use of their crude by home-state refiners and greater shipments also to out-of-state refiners.

Shipments of Louisiana crude averaged 943,000 bbl. daily last year. Of these, Louisiana refiners took 53.6%. The remaining 46.4% moved to refiners on the East Coast, Mid-Continent, and Gulf Coast.

Largest crude movement from Louisiana has been into Texas. Part of the Texas refining capacity is so located that the plants are within convenient shipping distance from Louisiana fields. As a result, Louisiana crude shipments into Texas have steadily increased, marking up an over-all gain of 66.8% since 1954.

Louisiana refiners, for their part, have gradually trimmed down use of out-of-state crude in their plants. In 1954, about 35% of crude moving to Louisiana refineries came from other states. This type of crude decreased to 28% by 1959.

Oklahoma steady . . . Disposition of Oklahoma crude is about evenly split

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between refineries within the state and plants in other states.

Total shipments out of the state in 1959 averaged 259,100 bbl. daily compared with 256,800 bbl. daily that went to refineries within the state. The split for 1954 was 246,200 bbl. daily going outside Oklahoma and 207,300 bbl. within the state. However, for the years 1956-58, shipments within the state were larger than the part going to out-of-state refiners.

Some changes show up in sources of crude for Oklahoma refineries. In 1954 Oklahoma refiners purchased 28.4% of their crude out of state. These purchases dropped off to 22.1% in 1957 but were back up to 30.5% in 1959.

Kansas buys its own . . . Refiners in Kansas are increasing the volumes of Kansas crude they process.

They took about 65% of the state's crude last year and this percentage has been increasing ever since 1955 when refiners in the state bought an average of 173,900 bbl. daily.

Local use of Kansas production climbed to 236,100 bbl. daily in 1959—a gain of 36% in 4 years. For the same 4-year period, shipments of Kansas crude out of state decreased 42,500 bbl. daily or about 25%.

New Mexico growing . . . New Mexico is gaining stature as an oil-producing state and is looking for markets both to the west and east.

About 60% of the crude moving out of New Mexico goes to Texas and 28% moves into the Midwest.

Shipments to the West Coast picked up sharply in 1957 and have shown excellent gains in the last 2 years. Shipments in 1959 averaged almost 30,000 bbl. daily.

These movements of crude to refineries outside the state increased 49.6% in the last 5 years.

Volumes of oil processed in New Mexican refineries also have made sharp percentage gains, although the volume still remains comparatively small. Only 24,200 bbl. daily of the state's 1959 production went to refineries within the state.

Trends . . . The shifts in crude movement over the last 5 years give some indication of changes in state markets.

Total crude production for a given state depends on availability of the crude and a market. Demand and availability still will be important factors in production in the future.

Demand for a particular crude has come to depend very much on quality of the crude and its laid-down price at a refinery. As for quality, this is now often measured in terms of processing costs and value of the products made from the crude.

watching WASHINGTON

Clyde La Motte

• Gas 'dumping' is a growing issue . . .

THE TIME is approaching when the various segments of the oil and gas industry are going to have to take a stand on the issue of the so-called "dump" sales of natural gas.

A showdown is sure to come, particularly at any time a push is given to natural-gas legislation. The coal industry will see to that, for coal people want an end to such sales and will oppose any gas bill that doesn't limit or ban them.

The coal view is that it's unfair competition for gas pipeline companies to be able to make large-volume industrial sales at prices below the cost of the gas and thereby "steal" coal markets.

Perhaps to gain widespread support for their view, coal officials stress the theme that the residential consumer of gas has to pick up a part of the tab for the gas the big industrial user gets. This can be done, coal says, because coal cannot compete for the residential customer.

The coal view to some extent is subscribed to by some oil groups who feel that low-cost gas sales are pushing them out of their own markets.

There is, of course, another side to the coin. Gas pipeline companies can provide pretty convincing facts and figures to back their stand that interruptible gas sales to industrial customers help the pipelines provide gas at a lower cost to the small gas consumers.

They point to the peaks and valleys inherent in servicing residential and other seasonal consumers. The industrial outlets, they say, help greatly in leveling out these peaks and valleys because they take their gas at the times when the consumer demand is low.

They readily concede that the interruptible industrial sales do not pay a strictly proportionate share of the pipeline costs. But because the industrial users take their gas when the line would otherwise be virtually idle, that use does help pay part of the costs and thereby makes the service to the small consumer less than if the small consumer had to foot all the bill.

In effect, they are saying that if a slaughter house can sell the soupbones it has on hand for even a few cents a pound it can sell the steaks at a lower price than if it got nothing at all for the soupbones.

• Carson may quit oil-control post . . .

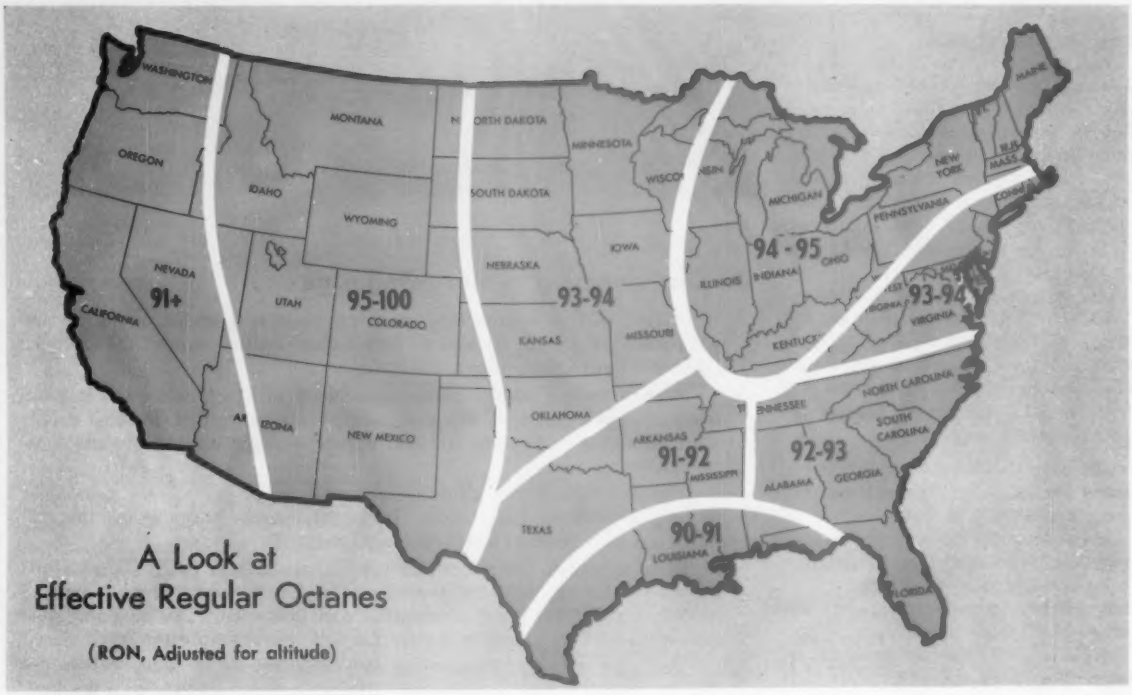
IT IS A GOOD BET that Matthew V. Carson will step down this fall as oil import administrator and as director of the Office of Oil and Gas.

Carson, a Navy captain, has reached the point in service where he may choose to retire—and there is strong indication that he will take advantage of that opportunity. Those close to him know he is giving it very serious consideration.

Carson apparently has enjoyed his role at Interior and his association with the oil industry. But life as oil import administrator hasn't been entirely a bed of roses, either.

Perhaps more important, Carson apparently feels that the basic job of getting the program established and in operation has just about been completed, thereby lessening the challenge of the role without lessening the headaches.

Matthew V. Carson



Regular Gasoline Quality May Climb

• An increase in the national average—now at 92.4 octanes—could be in the cards. That's because of likely boosts in some areas, such as Gulf and Pacific coasts, which now lag behind the rest of the nation.

THERE IS good reason to believe that the average quality of regular grade gasoline will be stepped up further during the coming season.

Three signs, at least, point sharply in that direction:

...The spread between the best and poorest quality of regular on the market today. It ranges up to 7 octane numbers.

...The pressure of the compacts, representing close to 25% of the new car market. They were designed for regular, but a surprising number have come up with higher octane appetites.

...The presence of several brands of regular at or above 95 Research octane.

Despite the fact that it's the world's leading refining area, the Gulf Coast has the country's poorest regular. House-brand gasoline in this area is not only low to start with but it does not benefit from altitude.

Altitude lowers a car's octane requirements so that a low-octane gasoline at high altitude will do as good a job as a high-octane fuel at sea level. That explains the high "effective" octanes in the Rockies. Since most of the Gulf Coast markets are within a few hundred feet of sea level, they benefit very little.

Not one of the eight cities in the Gulf Coast area was even close to the national average of 92.4 octanes, according to the March Ethyl Corp. survey of gasoline quality. New Orleans and San Antonio were almost a full number under the national average. Corpus Christi, Dallas, Fort Worth, and Jackson were more than two numbers under it.

Only one brand that showed up in as many as half the cities surveyed equaled the U. S. average. Its average for four cities was 92.8. It appeared only in the Texas cities in the four-state area. Other brands with general distribution in the area ranged from 90.2 to 91 RON, from 1.4 to 2.2 octanes below average.

Another distinctive feature of the Gulf Coast area was the prevalence of regular grade samples of less than 90 octane. Fifteen percent of the more than 70 samples tested in the eight cities was under 90.

The Pacific Coast, long the area with the lowest gasoline quality, tops the Gulf Coast area—but not by much. Not one of the generally distributed brands on the West Coast equaled the national average. The best was two-tenths of an octane below the norm.

Other widely distributed brands on the Pacific ranged from 90.1 octane to 91.9 and were from a half to 2.3 octanes below the average. Here, too, about 15% of the samples tested were under 90 RON. A couple were just a shade over 88 octane.

It's apparent that, if the compacts are giving trouble in some other areas of the country where gasoline quality is higher, they must be giving a lot more trouble on the Gulf and Pacific Coasts. Because of this, and also because they are so far behind the rest of the country, these areas can be expected to beef up regular quality.

These are not the only influences that are pushing upward on regular quality. Another is the presence of 95 octane regular in central Michigan and at a couple of East Coast points. Regular grade of this quality has been on sale in Michigan for about a year

Premium-Third Grade Gap Narrows

	No. of Samples	Average Research Octane	Average Motor Octane	Average Sensitivity	Average TEL Content
March 1960:					
Third Grade	49	101.7	93.0	8.7	2.67
Premium	493	99.5	89.7	9.8	2.44
Difference	...	**2.2**	**3.3**	**−1.1**	**0.23**
March 1959:					
Third Grade	43	101.7	92.9	8.8	2.69
Premium	496	99.1	89.0	10.1	2.46
Difference	...	**2.6**	**3.9**	**−1.3**	**0.23**
March 1958:					
Third Grade	40	101.5	92.6	8.9	2.84
Premium	489	98.5	88.2	10.3	2.49
Difference	...	**3.0**	**4.4**	**−1.4**	**0.35**

and in the east for several months. Only one other brand has as yet met these super regulars, but they undoubtedly are pushing up quality in their markets.

There were five regular samples in the March Ethyl survey that hit or exceeded 95 RON. The average for the five was 95.2. The premium gasolines of these companies averaged 100.7. Thus, there was a difference of only 5.5 octanes between their regular and premium.

There was speculation that there would be another upward push to regular when Sun disclosed its intention of coming out with a new gasoline. However, Sun held the line at 94 RON with its new 200X.

The superpremiums . . . While the big changes this year probably will be in regular, there's activity among the sellers of third grades, too.

The net effect of the changes in the superpremiums is to reduce the price spread between it and premium.

Esso Standard and Gulf as of now have cut the margin. Esso did it by shaving 1 cent off its superpremium price, leaving a 2-cent spread between it and regular. Gulf cut its spread to 2 cents, also, but did it by increasing the price of premium by 1 cent.

The actions brought much speculation. Companies that don't handle a third grade thought sales might have proved disappointing.

Companies handling a third grade say differently. Cities Service officials say, "We're not sorry." Officials of Gulf, with the most widely distributed superpremium, say they are "pleased" with sales. Esso Standard, which pioneered the third grade, is reported to have further improved its No. 1 position in the percentage of premium sales. It, as do most of the others, lumps premium and superpremium as premium.

This satisfaction of companies now handling third-grade gasoline indicates that it has a place in the picture. Two other developments support this conclusion. One is Continental's decision to go into four-state distribution; and the other is persistent reports that another major is about to embark on a superpremium campaign.

There are several possible justifications for cutting the price spread between superpremium and premium. One is the fact that high installation costs already have been met. Another is the narrowing of the quality gap between superpremium and premium. Two years ago there was a 3-octane spread. Now it's down to 2.2 octanes.

The big difference, however, is not in Research octanes but in motor. While the average motor octane of superpremiums has gone up 0.4 in the last 2 years, the motor octane of premium has increased 1.5 octanes.

Rupture Will Not Delay Transwestern's Line

• The 8.1-mile section affected is already being replaced. Cause of the break, the longest ever reported on a gas line, is being investigated.

AN 8.1-MILE section of X-56 high-tensile 30-in. pipe ruptured during testing of Transwestern Pipeline Co.'s gas line 58 miles northwest of Roswell, N. M. It is believed to be the longest rupture ever reported on a gas line.

The backfilled line was blown out of the ditch for most of the 8 miles, but the mishap occurred in a remote area and no injuries or property damage resulted, except to the pipeline. No delay in completion of the line is expected. Transwestern had sufficient pipe on hand for replacement and laying was already under way last week.

The $200-million line, which will deliver gas from Texas and Oklahoma fields to California, is scheduled to be completed in July and immediately placed in operation.

The line was being tested with natural gas under standard practices to just above 1,100 psi. The blowout occurred in a 10-mile segment adjacent to one actually under test. Gas was being bled into this segment and pressure had reached 850 psi. when the line broke about halfway between the block valves.

Representatives of Transwestern, the contractors, the pipe supplier, and specialists from research organizations were on the scene last week investigating the cause of the break.

Other breaks . . . Failure of pipe during testing is not unusual.

That is the purpose of a test—to find and eliminate weak spots. What is unusual is for a rupture to spread over that distance.

The most spectacular pipeline break ever reported was on Shell Pipe Line Corp.'s 10-in. crude-oil trunk line near Wichita Falls, Tex., December 12, 1939. A 32-mile section was ripped by a series of explosions touched off while testing for leaks with air. The rupture was not continuous, however.

A 3½-mile section of a 26-in. Venezuelan Government gas line, extending from Anaco to Caracas, blew out September 9, 1958. This line had withstood test pressure several times before failing, once under the original hydrostatic test and later after being filled with gas for testing downstream. It broke under dead pressure.

Union May Try to Get Company Benefit Funds

• OCAW declares it can accomplish more with the money. An apparent aim would be standardization of fringe benefits. Also, this could be a step toward nationwide bargaining, a long-time OCAW dream.

THE OIL, Chemical and Atomic Workers Union may launch a drive this summer to gain administrative control over fringe benefit funds.

Under the plan the OCAW is currently considering, a key bargaining point in 1960 would be an effort to get oil companies to turn over to the union all funds collected for pensions, insurance and other benefits—possibly even including vacation pay.

The union theory is that it could administer such funds more efficiently than individual oil firms are able to do. For instance, the union argues that it could get a better rate from insurance companies because it would be representing around 90,000 persons whereas a single company represents a few employes, or a few thousand at most.

Apparently, too, a purpose of the move would be to standardize fringe benefits nationally, so that an oil worker in one company would get the same fringe benefits as those in another. First, however, the union will probably seek to "sell" its plan to one or more companies and then put pressure on others to join.

Quite conceivably, this could be a step toward nationwide bargaining—long one of OCAW's fondest dreams.

May push soon . . . Since it is highly unlikely that any oil company would voluntarily turn over administration of fringe benefits to OCAW, the union will have to seek such control at the bargaining tables. And that is what may happen this summer.

The possibility of a union drive in this direction was discussed at some length in Washington last week by OCAW President O. A. (Jack) Knight.

Knight was in Washington for the fifth, and final, of a series of regional meetings the union has been holding in recent weeks to map its bargaining strategy for 1960.

The purpose of the Washington meeting, and those held earlier in Dallas, Kansas City, Salt Lake City, and Chicago, was to sound out local union sentiment and choose the membership of a national petroleum bargaining policy committee which will draft specific union targets and tactics.

The 11-man bargaining policy group will be made up of ten rank-and-file union members and Knight. It differs from past policy groups formed by the union in that no official of the national organization, other than Knight, will be on the committee.

O. A. (Jack) Knight

Knight said union members he has talked with have shown interest and enthusiasm in the fringe benefit fund plan.

He made it clear, however, that even if the idea is adopted as a prime target for this year's bargaining, it will not eliminate efforts to obtain other union goals.

Other issues . . . Knight left no doubt doubt that the union will try to win wage hikes this year, but he did concede that if emphasis is put on the benefit fund, there would probably be less pressure for wage increases.

He did not indicate what wage hike target the union will shoot for, saying that such a decision would be made by the 11-man committee, based on recommendations of local committees.

He also mentioned other issues which the union is likely to bring up at the bargaining table. These include the inroads made on manpower by automation and the growing practice of some companies to contract out some of their work, such as plant maintenance, rather than having it done by company employes.

Knight complained that oil companies have made little effort to retrain surplus personnel for other jobs within that company or for possible employment in other companies or industries.

He also indicated that a shorter work week may be sought, at least in some instances, as a partial step toward reducing the impact of automation.

More than half of the union's contracts can be opened for bargaining purposes this year, Knight said, either because of contract expiration or reopening clauses. This, he indicated, would enable the union to marshall considerable strength to apply bargaining pressure.

With the regional conferences now concluded, Knight indicated that the next step—calling of a meeting of the bargaining policy committee to draft plans—would be taken soon.

INDUSTRY BRIEFS . . .

Ohio Oil Co. has bought McClure Oil Co.'s oil and gas interests in the 500,000 - acre Aurora - McClure oil lands in southern Michigan. The acquisition involved $7 million in cash and oil payments. Ohio acquired stock of the Aurora Gasoline Co. last August, becoming operator of 500,000 acres in the Scipio - Albion - Pulaski area.

The second half of a $55-million deal has been completed with the sale of San Jacinto Petroleum Corp.'s interest in South Louisiana producing properties of Mecom Petroleums to General American Oil Co. of Texas. Earlier, John W. Mecom, Houston, sold his 50% interest in Mecom Petroleums for about $27.5 million to General American (OGJ, Feb. 29, p. 56).

A new type miscible drive has been approved by the Texas Railroad Commission for Humble Oil & Refining Co.'s Seeligson Zone 21-A field in Kleberg County. Injection of enriched gas simultaneously with water is proposed. Use of water is planned to improve the miscible drive's poor areal sweep efficiency (OGJ, April 4,

Canada's New Northern Regulations Vague

• Minister admits rules for oil and gas development are target for lawyers. Section dealing with foreign companies is ambiguous. A court fight may also develop as federal government makes first claim to tidelands.

ONE THING clear about Canada's new regulations for oil and gas development is that they are confusing.

The stated purpose is to require Canadian participation in petroleum development of all areas under federal jurisdiction.

Northern Affairs Minister Alvin Hamilton concedes the wording of the regulations is such that "any lawyer could tear holes in them."

The prospect of provincial lawyers doing just that is made likely by the federal government's assertion, for the first time, that it owns the resources lying off the coasts of the Maritime provinces and British Columbia.

This claim could be the first legal shot in a Canadian tidelands battle, similar to the one which has been raging in the U. S. for years.

The new regulations are now in force. They cover development of the Yukon, the Northwest Territories, the continental shelf and the Arctic islands.

Existing permits, licenses and leases are not disturbed. However, new leases must comply with the still-ambiguous Canadian ownership regulations.

The regulations were drawn after more than a year's study, 30-odd cabinet meetings, and scores of conferences among government officials.

Varied Views . . . The results appeared to confuse even the minister. At a conference called to explain the regulations, he gave two different interpretations of one provision.

At one point he said purely foreign firms could obtain leases under certain conditions. Later, he amended this view to say the companies would have to be incorporated in Canada, and a portion of the shares sold to the Canadian public.

Government legal experts subscribe to the amended position, he said, but it is being questioned by attorneys acting for the oil industry.

Those who contest the provision believe a foreign company would simply have to register in Canada and not establish a separate subsidiary selling shares of its own. Thus, the only shares available would be those of the parent company.

From the Canadian investors point of view, the government attorneys' interpretation is more desirable. Shares in a parent company with world-wide operations would only enjoy a slight rise in the event of successes in the Canadian north. Presumably, domestic shares would increase much more if strikes are made.

Even if the government view prevails, nothing is cut and dried. For the regulations do not specify precentages of Canadian participation. This is left to the discretion of Hamilton.

He explained the government sought to avoid overly-restrictive rules, lest they discourage foreign capital for northern development.

"We don't want to kill the golden goose," he said.

Offshore claim . . . The offshore rules are more specific. They apply to oil and gas below the shallow waters of the continental shelf surrounding Canada. They declare, in effect, that these resources are under the jurisdiction of the federal government, rather than adjacent provinces.

The question of control of these resources has never been settled by law. Hamilton agreed the government's claim might be open to question.

In one case the government has already exercised its assumed right by granting offshore exploration rights in the vicinity of the Queen Charlotte Islands, a part of British Columbia.

Colorado Leases Contested

THE STATE of Colorado hopes to kill oil leases on more than 6,400 acres of state land in southwestern Colorado in a suit against the State Land Board and two oil firms—British American Oil Producing Co. and Sunray Mid-Continent Oil Co.

The land board leased the land to the two companies for 50 cents an acre in 1957 over the protests of the State Board of Agriculture. In filing the suit this week in District Court at Durango, the state claimed Land Board lacked authority to make the leases. The land is on the Fort Lewis A&M campus, which, the suit says, is controlled by the Board of Agriculture.

Some members of the Colorado Legislature say the oil leases were made at prices far below those received for nearby land.

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p. 74). Authority to transfer allowables of injection wells and to expand the project without further hearing was granted Humble.

Taylor Drilling, Lewiston, Mont., has been merged into Great Northern Drilling, Billings. Ike W. Taylor, president of Taylor, has become chairman and director of Great Northern. The latter firm has acquired four rotary drilling rigs and all other equipment of Taylor.

Stockholders of Fifteen Oil Co., Houston, have approved the sale of the company to Tennessee Gas Transmission in exchange for stock valued at about $17.4 million. Tennessee Louisiana Oil Co., a TGT division, will operate the properties of Fifteen Oil.

Stanton Oil Co., San Antonio, has purchased 2,000 acres of Cochran County, Texas, leases containing 11 producing wells. The former owner is Sapphire American Petroleums, Inc., subsidiary of Sapphire Petroleums, Toronto.

Oklahoma Well Information Service, Inc., has been organized as a nonprofit corporation to collect and file electrical, gamma ray, and neutron logs, scout cards, well-completion data, and basic well information. Offices are at 414 McFarlin building, Tulsa. Kent K. Kimball, president, said information is available on a membership basis.

Permit for quadruple completion of Humble Oil & Refining Co.'s No. 8 J. W. Godwin oil well in Taft field, San Patricio County, Texas, has been granted by the Texas Railroad Commission. The well will produce from the 4,000-ft. sand, the A-2 and A-6 sands, and the Sinton sand. It will produce through three strings of 2⅞-in. casing, one of them dually completed by addition of tubing and a packer.

Big Prorated States Trim Allowables for May

- Producers join buyers in many instances to recommend slash in oil supply to halt spread of purchaser proration and price cutting.

THREE MAJOR oil-producing states—Texas, Louisiana, and Oklahoma—have moved to choke back the flow of oil. The move was aimed at undergirding the price structure.

The Texas Railroad Commission cut the state back to 8 producing days in May. Oklahoma's Corporation Commission pared its allowable 20%. Louisiana's Conservation Department lopped 30,000 to 40,000 bbl. daily off its allowable, the first cut in Louisiana since 1958.

In each state, the action was asked by purchasers and producers who wanted to halt an oversupply of domestic crude which has weakened prices in several areas and brought on purchaser proration in others.

Louisiana mystery . . . The allowable may rise again in Louisiana if an expected solution is found to a long-standing mystery.

The puzzler: Why do purchaser nominations fall far short of actual purchases?

Conservation officials believe they have found the discrepancy in purchases made from second parties. In many cases the purchaser has not been nominating this crude, and neither have the second parties, thinking this was done previously.

It may take several months for the department to track down all the crude which is purchased but not nominated.

Conservation Commissioner Ashton Mouton set the May and June allowable at 33% of the March 1953 level. The allowable for March and April was 35%, and prior to that was 34% for 16 months.

Mouton based the reduction on rising stocks and the prospect of weak demand. Nominations for May and June ran to about 822,000 bbl. daily, which was nearly the same figure nominated for March and April. Even with the reduction for the next 2 months, the allowable still will run about 65,000 bbl. higher than nominations.

Mouton reported the department can account for this as representing crude which has not been nominated—and not as crude produced in excess of market demand.

TEXAS ALLOWABLE BY DISTRICTS

District—	May	Decrease from April 2
1. Southwest	50,662	1,563
2. Gulf Coast	103,749	11,626
3. Gulf Coast	336,191	23,447
4. Southwest	168,444	14,781
5. East Central	27,044	2,717
6. Outside East Texas Field	104,463	10,510
6. East Texas Field	120,315	13,744
7-B. N. Central	143,008	6,759
7-C. W. Central	127,857	11,616
8. West Texas	1,012,789	104,813
9. North Texas	254,198	6,794
10. Panhandle	126,174	923
TOTAL	2,574,894	209,293

Oklahoma low . . . The Oklahoma allowable cut put the state's production for next month near a record low.

The May allowable will be reduced 20% from April unless the cut will reduce daily rate for individual wells below 15 bbl. In that case minimum allowable will be 15 bbl. The record low allowable was 14 bbl. daily per well last summer.

Conservation Director Massena B. Murray estimated the order will produce 507,000 bbl. daily of oil. Crude buyers nominated only 494,985 bbl. daily for May. Oklahoma producers in first part of April averaged 540,468 bbl. daily on a basic per well rate of 18 bbl. daily.

Commission Chairman Ray Jones said he doubted if the lower allowable will eliminate purchaser proration in Oklahoma. It may allow other companies to take crude from those who can't buy their full quota, he added.

Texas runs 8 days . . . Independent producers and major crude buyers alike asked the Texas Railroad Commission for the allowable cut.

The 8-day production allowed for May will average 2,574,894 bbl. daily. This is a cut of 209,293 bbl. daily from the allowable as of April 2 and a cut of 239,358 bbl. daily from the initial allowable set for April.

Majority of the crude buyers favored the 8-day pattern. Eight of them nominated on this basis, four of them for 9 days. Indiana Oil Purchasing Co., still prorating at a rate of about 80% of its January runs, nominated only 7 days.

Indiana's pipeline proration is across the board, affecting water-flood production along with the rest. A spokesman for the company said it hopes to be able to lift its proration under the 8-day schedule but refinery turnarounds make this uncertain.

Many worried independents joined Indiana in recommending the 7-day production pattern. They told the commission they doubted that 8-day production would be enough to halt pipeline proration.

Their prime concern, however, is the shaky crude-price structure. A drastic tightening of crude supply, they feel, is their only effective weapon to combat the spread of the present scattered price cuts in North and East Texas and the Gulf Coast.

Canada-to-California Line Hits Snag

CONSTRUCTION of a 1,400-mile 36-in. gas line from Alberta to San Francisco could be held up if the California Public Utilities Commission follows the recommendation of its attorney.

The commission's attorney, Harold McCarthy, last week objected to favored-nation and stepwise escalation clauses in gas contracts with Canadian producers who will supply the Pacific Gas & Electric Co. line. He said these clauses might lead to unreasonable price increases to California consumers.

McCarthy recommended that a decision on the California section be withheld pending renegotiation of the producer contracts.

Canadian approval to export gas through the $340-million line was granted early this month (OGJ, April 11, p. 83). Hearings on the section of the line through Idaho, Washington, and Oregon, to be built by PG&E's affiliate, Pacific Gas Transmission Co., have been held before the Federal Power Commission.

If the favorable FPC ruling comes through as expected, only the California commission will stand in the way of the gigantic project.

NEW PLASTIC-COATED

EDWARD VALVES GIVE LONGER WATERFLOOD SERVICE LIFE

Now you can get economy-priced forged steel valves and strainers with a tough plastic coating baked on the inside. EValcoat*, an exclusive Edward plastic coating, assures greater protection from the corrosive and erosive effects of salts and sulphides in waterflooding service, as proved by actual field testing. These new Rockwell-built Edward valves work equally well in other secondary recovery and pressure-maintenance systems.

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Figure 2498
2000 lb. WOG
1" Size, Inside Screw,
Union Bonnet,
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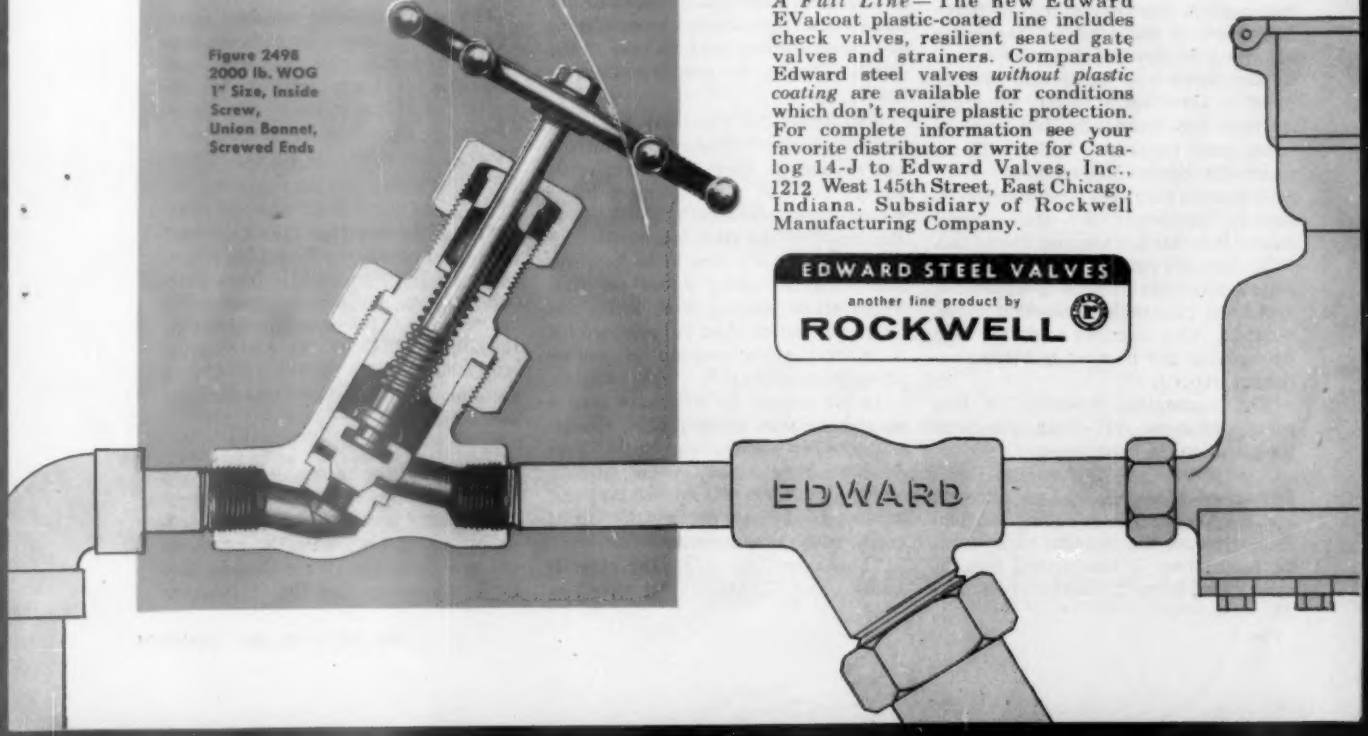

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Drilling to Increase in Rockies

. . . as better weather arrives. Use of automatic data transmission, LACT units increasing, API meeting told.

OPTIMISM was the password at the Casper meeting of the Rocky Mountain District of the API Division of Production.

And these are some of the reasons: Drilling activity is picking up in the Rocky Mountains, progress has been made in lease automation, and excellent results are being obtained in the use of the abrasive jet for perforation and fracture initiation.

Drilling is off in most of the United States, but Rocky Mountain operators apparently haven't heard the news. They are going about their business of drilling wells, in good weather or bad.

But favorable weather will probably bring an upturn in the already active drilling programs.

One operator said that excessive costs were incurred during last spring's thaw and that some of his locations would have to wait till later in the spring. But this was the only hint of postponement of drilling activity. Most operators have been drilling and are still at it.

Automation growing . . . Because of remote locations in the Rocky Mountain regions, few operators can afford to be without LACT units. And engineers are encouraged by the trend toward standardization.

Positive displacement meters seem to be the unanimous choice of engineers attending the meeting of the subcommittee on instrumentation and automation. The only expensive drawback now is the outdated regulation requiring 30-day proving tests.

Experience has shown that proving need be done on a 60-day schedule, or even less frequently, but rules of some state regulatory bodies still require the costly 30-day tests.

Automatic data transmission is equally important for the isolated lease. But this has complications, too. FCC has few available radio bands; leased wire transmission is expensive, and so is electronic equipment maintenance. One operator reported that he replaced one pumper by three electronics experts.

The consensus, however, is that these problems will work out with time and more experience.

Formation notching . . . In a question and answer period following a panel discussion on the benefits of hydraulic perforating, it was agreed that, in most cases, lower breakdown pressures were encountered and greater potentials were obtained in wells using formation notching prior to fracturing. Where a well was treated with acid, injectivity was increased.

Operators were generally enthusiastic over results obtained with hydraulic perforating tools, whether for normal perforation or for fracture initiation.

Price Cuts Checked

. . . for antitrust aspects by Texas' attorney general.

THE TEXAS attorney general is again checking to see whether the state's antitrust laws have been violated by oil purchasers' crude price-cutting moves.

The cuts which led Gov. Price Daniel to request such action were those by Sinclair Crude Oil Co. in East Texas and the Corpus Christi area and by American Petrofina Co. of Texas in North Texas.

The current investigation is the second made by the office of the Texas attorney general, Will Wilson, in less than a year. The first came after Atlantic Refining Co.'s initial cut in East Texas last spring. So far as is known, nothing came of it.

Informed sources feel the governor's action both times was intended to dissuade other purchasers from joining the price cutting and in hopes the firms initiating the cuts would backtrack.

The threat last year may have had some such effect. Though Atlantic did not rescind its East Texas cut, other buyers did not move to meet it. In recent weeks however, Premier Oil & Refining Co. and then Sinclair slashed their East Texas prices. Now there are four different going prices for East Texas crude ranging from $3.05 and $3.25 per barrel. And the pressure for a general price revision is getting stronger.

In his request to Wilson to start a second antitrust investigation, Governor Daniel pointed out that Texas finances had already been dealt a heavy blow by previous price cuts and excessive oil imports which forced crude-production cutbacks.

"This year," he said, "the state is losing about $2,000,000 per month in oil taxes as compared with the similar period in 1957."

In North Texas it appeared the threat of another general cut may have been contained by an offer of Continental Oil Co. to pay present posted prices for most of the crude now bought by American Petrofina.

The Petrofina cut pared 19 cents a barrel off its price for North Texas oil—from the former $3.01 price to a top of $2.82 a barrel.

Bonus From Subsidence

THE huge water flood in California's Wilmington field, which was designed primarily to halt subsidence, already is paying off a bonus to the tune of 4 million barrels of oil.

This $10-million worth of crude came from the Long Beach controlled tidelands part of the field alone. It also is over and above the expected primary recovery, M. D. Hughes, director of petroleum and subsidence control operations for the City Harbor Department, told the Harbor Commission last week.

As of April 1, a total of 135 million barrels of water had been injected into the tideland portion of the field. This has increased production on these properties by 6,600 bbl. daily.

On the basis of experience thus far, secondary-recovery benefits of the flood could amount to 300 or 350 million barrels of oil with a value of about $1 billion.

PIPELINE

The use of depleted uranium metal as a sacrificial anode for cathodic protection of buried pipe and other steel structures is being studied by the Bureau of Mines at Rolla, Mo. Magnesium is the most commonly used material for sacrificial anodes to prevent corrosion.

Sale of Service Pipe Line Co.'s half interest in Muskegon Pipe Line Co., a 165-mile 10-in. crude line from Griffith, Ind., to Muskegon, Mich., has been made to Marathon Pipe Line Co., subsidiary of Ohio Oil Co. Service built the line in 1957 with Aurora Gasoline Corp., which was merged into Ohio Oil last year.

A new bid for an export permit has been filed with the National Energy Board of Canada by Niagara Gas Transmission Co., which proposes to sell gas from the Trans-Canada line to St. Lawrence Gas Co., a Niagara

Low-Cost Crude-Treating Unit Developed

- **Pilot unit has treated about 200,000 bbl. of oil on Oklahoma lease.**

CARPCO - KEWANEE, INC., is testing a new electric heater treater which it says will hold operating and maintenance costs to a minimum.

The unit has been operating for several months in Kewanee Oil Co.'s Home et al. lease in Cache Creek field, Cotton County, Oklahoma. The test treater has been handling 1,800 bbl. of emulsified crude per day and has treated about 200,000 bbl. of crude since it was placed on the lease.

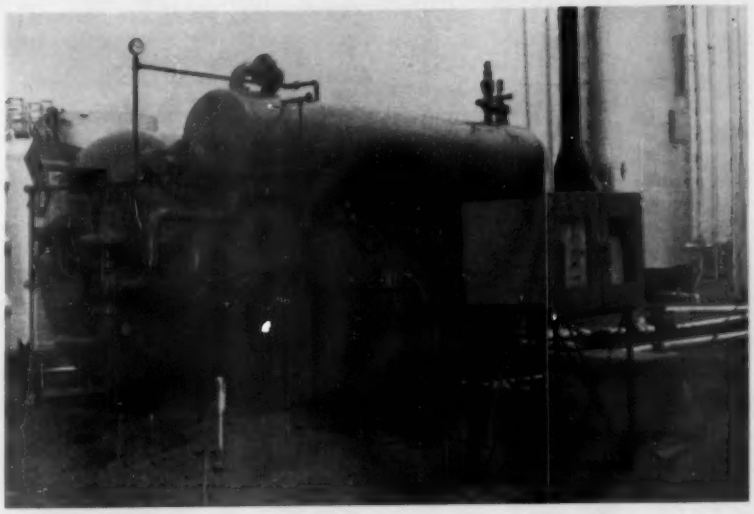
The treater was developed through the efforts of Norbert A. Parker, head of Kewanee Oil's special projects section, and J. Hall Carpenter and John L. Carswell of Carpco - Kewanee. Carpco-Kewanee plans to license the treater and method.

Carswell says the treater has several advantages:

... **There are no filter** beds to be changed.

... **Heating** is required only if the crude is too viscous to flow.

... **The unit is smaller** than conventional treaters of the same capacity and will handle hard-to-break emulsions, yielding a drier product.



A NEW electric heater treater which features compactness and low operating costs has been developed by an affiliate of Kewanee Oil Co.

... **The electrodes** can't short out even if the unit is handling 100% water. The unit also has an automatic shutoff to prevent an explosion which could develop if too much oxygen builds up in the unit.

Carswell says the experience in Cache Creek shows the operating costs for the new unit are low. For a normal emulsion, there is no operating expense other than the cost of electricity and depreciation.

A transformer and rectifier supply 18 milliamps of direct current at 25 to 30 kilovolts to the electrodes from a 5 amp., 220-volt, single-phase power source. The control panel contains a variable-voltage transformer for controlling the electrode potential, and meters for instant power readings.

BRIEFS . . .

affiliate, of Ogdensburg, N. Y. The board earlier rejected the application on grounds the proposal was not economic. St. Lawrence would build a 75-mile, $5,862,200 line from the border at Cornwall, Ont., to Ogdensburg. An FPC examiner has recommended the St. Lawrence project over a competing plan by New York State Natural Gas Corp. to supply gas to Niagara Mohawk Power Corp. Niagara Mohawk proposes a $14½-million line from Watertown, N. Y., through Ogdensburg and Massena to Malone.

Construction will begin soon on a 45-mile 20-in. gas line which Atlantic Seaboard Corp. has awarded to Williams Brothers Co., Tulsa. The line extends from Terra Alta to Seneca station, W. Va.

A permit to build a 125-mile natural-gas liquids line from the Dick Lake gasoline plant, operated by British American Oil Co., to underground storage in the Hughenden region of eastern Alberta is being sought by Hughenden Pipeline. The Alberta Oil and Gas Conservation Board is being asked to approve the project to deliver products to Alberta Underground Storage, Ltd., owned by Canadian Hydrocarbons, Goliad Corp., and British American.

Michigan-Wisconsin Pipe Line Co. will be ready to rush through its 342 miles of 24-in. and 188 miles of 30-in. looping program when it clears FPC, which will open hearings in May. Contracts have been awarded to R. H. Fulton & Co., 270 miles in Texas, Oklahoma, and Kansas; Bechtel Corp., 120 miles in Illinois and Indiana; Majestic Contractors, 60 miles in Illinois; and Somerville Construction Co., 80 miles in Michigan.

A hearing on two applications for crude-gathering systems in northern North Dakota will be heard May 18 by the State Public Service Commission. Applicants are Barron Kidd, Dallas, and International Refineries, Inc., Wrenshall, Minn.

Also for Pipeliners . . .

IN THE NEWS: Gas men may find the going in Washington tougher as result of FPC investigation which also may unseat most of the commission (p. 97) . . . Gas confusion is created by Congress and not by FPC, Commissioner Kline says (p. 99) . . . Interstate crude movements are playing more important role in oil markets (p. 100) . . . An 8-mile rupture will not delay Transwestern's new gas pipeline to California (p. 105).

PLUS THESE TECHNICAL REPORTS: Reduction of commingling is prime target at airport line (p. 200) . . . Pipeline construction report (p. 211).

CLEAN FUEL

WARNER LEWIS EQUIPMENT PROTECTS THE JETS

Clean jet fuel is essential to safe jet aircraft operation. Today, all aviation fuels may be provided the ultimate protection against fuel contamination. The new Warner Lewis 2-stage separator/filter eliminates jet fuel contaminants — free water and dirt — and delivers the cleanest fuel ever demanded by commercial or military aircraft.

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Three Seek Leases in Atlantic Off Georgia

• Pure and Hunt offer bids for all of state's tidelands while Houston operator seeks rights around small area.

THE SEARCH for oil may move into the waters off Georgia in the next 2 years.

Georgia's Mineral Leasing Commission received bids last week from Pure Oil Co. and the H. L. Hunt interests for leases covering the state's entire Atlantic coastline. Both bids carry drilling rights.

The commission is expected to act on the bids when Gov. Ernest Vandiver, chairman, recuperates from an illness.

The acreage involved is rank wildcat territory. It covers a strip about 100 miles long. Pure's bid covers the area from the low-water mark outward 3 miles. Hunt's bid specifies it will take leases on all offshore land claimed by Georgia, whether the seaward boundary be 3 miles or 3 leagues (about 10½ miles). Hunt also wants to lease the state's inland waters along the coast.

Pure's bid would cover an estimated 238,000 acres while the Hunt bid, if the 3-league boundary is accepted, would cover more than 600,000 acres.

Drilling commitments . . . In its bid, Pure said it would explore the area for 18 after its bid is accepted, then drill a well within the next 3 months.

Hunt would start drilling within 90 days after its bid is accepted. The company agreed to drill 10 wells to 6,000 ft. or to the Lower Tuscaloosa formation. Hunt also specified it would start a second well and any succeeding wells within 60 days from the completion of the previous well.

Pure accompanied its bid with a bonus offer of $50,000, which included the first year's rental of 10 cents per acre. Hunt offered a flat $25,150 bonus. The bid also was accompanied by a check for $50,000 as a delayed rental in case it failed to fulfill its drilling commitments.

Roderick A. Stamey, Houston geologist and consultant, also submitted a bid at the sale last week. Stamey offered to lease about 28,000 acres around St. Catherine's Island and nearby submerged lands in Liberty County near the north end of Georgia's coastline.

The lease sale, sought by Pure, is the first for offshore Georgia and reaffirms the new interest in the state's oil potential (OGJ, Mar. 28, p. 101).

Georgia's $250,000 reward for bringing in the state's first commercial oil well failed to have much effect on Pure and Hunt. Both companies waived the reward. Pure said it would split it between two Georgia hospitals if it brings in a producer. Hunt merely waived the reward.

Top Court Gets Gas-Purchase Question

THE FUTURE of direct field purchases of gas by a utility for use as boiler fuel will be decided by the U. S. Supreme Court.

The court agreed last week to hear arguments on whether the Federal Power Commission can bar interstate transportation of gas bought under those circumstances. The sale itself is not regulated.

The case arose when FPC denied Transcontinental Gas Pipe Line Corp. permission to provide transportation service for Consolidated Edison Co., New York (OGJ, Feb. 9, 1959, p. 80).

FPC ruled that such use would preempt for industrial purposes pipeline capacity which could meet more urgent and beneficial public needs.

The decision was overturned by the U. S. Third Circuit Court of Appeals in Philadelphia (OGJ, Nov. 9, 1959, p. 113). The case reached the Supreme Court on an appeal from the circuit court ruling. A decision isn't expected for several months.

PROCESSING BRIEFS . . .

Runnels Gas Products will expand the capacity of its natural-gas plant at Tepetate, La., to 600 million cubic feet daily. Completion is scheduled for January 1961. Runnels is a wholly owned subsidiary of Union Texas Natural Gas Corp. The Tepetate plant, built in 1958, had a capacity of 300 million cubic feet daily. An expansion in 1959 increased capacity to 400 million cubic feet daily.

Ortho-xylene will be produced at a new multimillion-dollar plant to be built by Cities Service Co. at its Lake Charles, La., refinery. With a capacity of 120 million lb. per year, this unit will process feedstock from existing facilities. Production will be exported for sale through an agreement with Cosden Petroleum Corp.

Construction of a UOP Hydrar unit is planned by Continental Oil at its Ponca City, Okla., refinery. Procon, Inc., will build the unit, which is to be completed in September. Capacity will be 20 million gallons of cyclohexane per year.

The reopening of a 2,000 bbl. refinery at Dickinson, N. D., formerly owned by Queen City Oil & Refining Co., is scheduled within 2 months. Pacific State Oil Co., Billings, Mont., has purchased the plant and will produce jet fuel.

Shell Oil Co. of Canada is considering construction of a refinery near Calgary. It has taken an option on a 310-acre site southeast of Calgary and has a development permit.

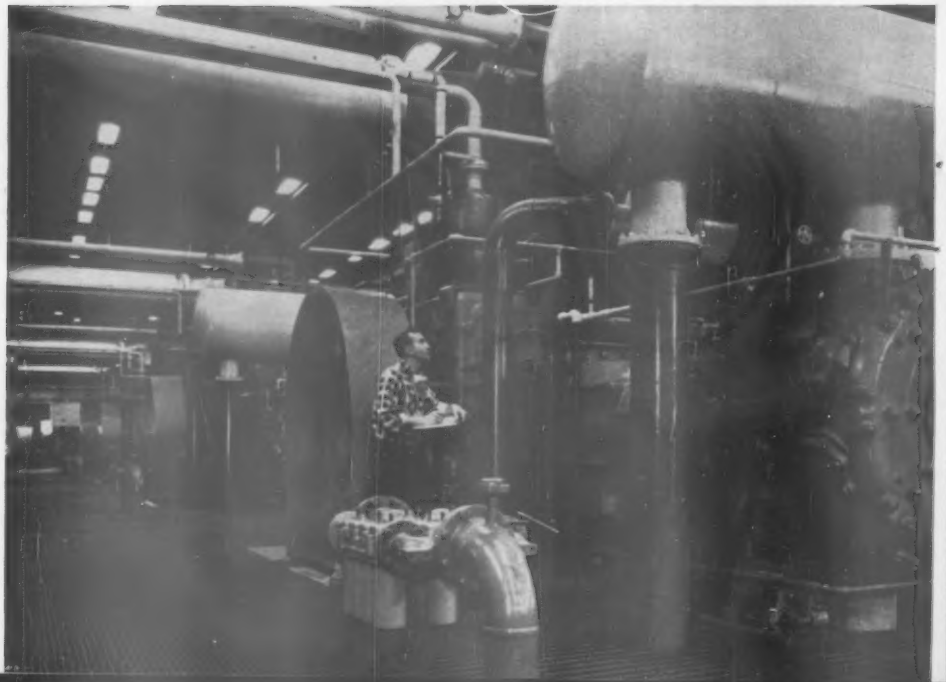
Great Lakes Carbon Corp. will build a plant at Enid, Okla., to produce petroleum coke. The plant will cost from $3 to $5 million. Construction will start in 12 to 18 months.

Also for Refiners . . .

IN THE NEWS: Biggest gainers in shifting domestic crude markets are Louisiana and Rocky Mountain region, Journal survey shows (p. 100) . . . Signs now point to an increase in regular gasoline quality this season (p. 104) . . . Big prorated states trim allowables for May to alleviate oversupply (p. 108) . . . Lube demand expected to make small increase this year (p. 117).

PLUS THIS TECHNICAL REPORT: Analog computer leads the way to better control (p. 202).

Cooper-Bessemer compressor shown is one of two units for compression of synthesis gas.



View showing the four Cooper-Bessemer compressors. Unit in foreground is for "mixed gases" (air, nitrogen and methane).

Henry LaRue, *Ammonia Area Superintendent, Spencer Chemical Company, Vicksburg, Mississippi explains...*

How we compress four different gases with a team of four Cooper-Bessemer compressors

"Our entire ammonia plant depends on the uninterrupted flow of component gases, compressed by four Cooper-Bessemer GMW-8 Compressors," reports Mr. LaRue. "These four 2000 hp gas engine driven units have been the heart of our system 24-hours a day, day in and day out, since 1953.

"Two of the compressors, with five cylinders each, compress three different gases... air, nitrogen and methane. The other pair of compressors pump a synthesis gas mixture of hydrogen and nitrogen.

"Despite their 'round-the-clock operation for seven years, none of these Cooper-Bessemer compressors has had a major down-time for maintenance. They represent a sound investment."

Cooper-Bessemer engineers are at your service to help you plan compression and power facilities. Call the nearest office.

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Interior's Bennett Handles the Tough Jobs

- **The stature of this government career man is growing. He has ability, aggressiveness, and can say "no."**

INCREASINGLY, Elmer Bennett, 42, is becoming a figure to reckon with at the Department of Interior.

As Under Secretary of Interior, he is Secretary Fred Seaton's right-hand man, and there is little doubt that many of the key decisions made at Interior—including those on major oil issues—are those of Elmer Bennett.

For instance, the lights were burning late in Bennett's office last winter as the deadline neared for announcing the oil-import quotas for the first half of 1960. And it was from Bennett's office that the final figures emerged.

Recently, it was Bennett who was caught in the cross-fire between major importers and the coal industry in the battle over residual quotas.

This was not an altogether new experience for Bennett because he has had to face other unhappy delegations, unhappy congressmen, or unhappy party leaders applying pressure.

Part of this stems from the nature of Bennett's job and the nature of Washington political operations. It is considered natural that the No. 1 man in the department (the secretary) likes to make the pleasant public announcements and to sign the letters which grant someone's fond wishes. Just as natural, it is the No. 2 man in a department (the under secretary) who usually gets the job of making the unpleasant announcements and who signs the letters which say "no."

Also, in the case of oil-import controls, there appears to have been a deliberate decision to handle controversial issues at the top level to help avoid getting the Oil Import Administration openly involved in them and thereby endangering the OIA's normal functioning as an impartial arbitrator.

But whatever the reasons, it is evident that Bennett's stature has increased, so much so that there is speculation that if the Republicans win the White House again, Bennett has a better than fair chance of becoming Secretary of Interior next year.

Background . . . Who, then, is this man?

Basically, he is a government career man. He has risen through the ranks, and he has risen rather rapidly.

His first government service was in management and planning work with the Ordnance Department of the U. S. Army. Then he was a trial attorney in antimonopoly work at the Federal Trade Commission from 1948 to 1951, when he became legislative and legal adviser to the late Sen. Eugene D. Millikin.

He entered the Department of Interior in 1953 as special assistant to the solicitor and as legislative counsel for the department. He moved up to assistant to the secretary and then to the post of solicitor before he was appointed by President Eisenhower in 1958 as Under Secretary.

His friends attribute his rapid rise to his ability, his aggressiveness, and his ability to work with others, both superiors and subordinates. Although he is friendly, and smiles often, he leaves the impression of a restless, driving energy.

Elmer Bennett

There is little doubt that, on occasion, he can be tough-minded and hard to sway. For example, regarding the residual fuel import control plan, he was convinced that a few companies had been guilty of irresponsible action and thereby had endangered the over-all control plan.

He made that view clear in a letter to Jersey Standard, and he still maintains that view even though a decision was eventually made—apparently at a higher level—to increase the resid quotas.

System not perfect . . . Bennett concedes that the allocation procedure used for residual fuel leaves something to be desired.

It requires Interior to estimate in advance the supply-demand picture for residual fuel. If there is any in-

Bennett Tells NPA Crude Import Exchanges to Stay

THE GOVERNMENT has no intention of ending its practice of assigning crude oil import quotas to inland refiners, nor of prohibiting exchange agreements.

Interior Under Secretary Elmer Bennett made that clear last week in a speech before the National Petroleum Association at Cleveland.

Bennett obviously was answering critics of the program who maintain that inland refiners who never imported or used foreign crude now receive quotas which they are able to exchange—at a profit—for domestic crude. The critics call this a "windfall" for the inland refiner, and say that it penalizes the companies that took the risk of going into foreign lands. When government officials originally considered control plans, they reached the conclusion that refinery runs constituted the fairest common denominator for allocation of crude imports.

"The very bedrock of the program had to be a fair sharing of the competitive advantages of imported oil," he said.

"The real windfall would accrue," he insisted, "if the federal Government by administrative decree protected the import position of a refiner because of geography or overseas productive capacity and denied access to all others."

Furthermore, Bennett told the NPA, even if exchange agreements were not allowed, the coastal refiner would not receive any larger allocation than under the existing program.

He claimed that the present program helps stabilize markets and that it helps build a stronger domestic industry—including the inland refiners.

dication that it has guessed either too high or too low, it is immediately subject to complaints from those who are affected.

By contrast, the crude-oil allocations are tied to a percentage factor rather than to a supply-demand estimate. Thus, they are less subject to criticism.

Bennett says that Interior is aware of this and that he and OIA officials have sought a better method for assigning residual fuel import quotas. Thus far, they have not evolved a new plan.

The Under Secretary insists that he is not a "control" man at heart. He points out, however, that a majority in the oil industry itself apparently felt that government regulations of oil imports was necessary.

He also notes that Congress has specifically given Interior the responsibility for not only protecting but encouraging domestic development of this nation's natural resources. He therefore considers it Interior's duty to try to achieve these ends.

He considers the encouragement of private domestic enterprise as a superior method, in most instances, to outright government participation.

For instance, he and the Interior Department have recommended to Congress approval of an increase in percentage depletion for shale oil to 27½% (it is now 15%).

"The justification is different than that for oil percentage depletion," he says, "but we feel there is ample justification."

Pure Hits Again at Lisbon

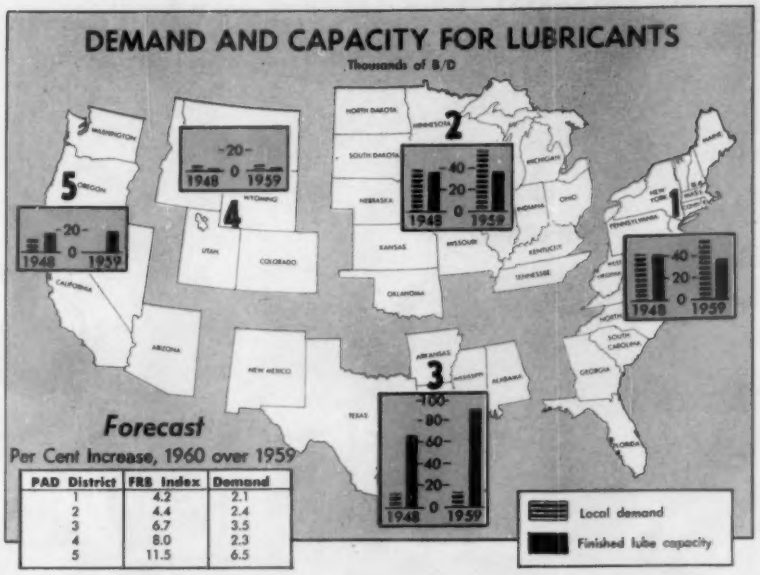
THE DEVONIAN is a new producing horizon for Colorado.

Pure Oil Co. recovered gas from both the Ouray and Elbert at its second well on the Southeast Lisbon prospect in San Miguel County, Colorado. The operator gaged 2,500 M.c.f. of gas daily from Ouray Devonian at 8,821-61 ft. on 1-in. choke. From Elbert at 8,887-8,988 ft., flow was 2,250 M.c.f. of gas daily plus 2 bbl. of condensate per hour.

The wildcat is about 25 miles southeast of the famous Northwest Lisbon discovery made late last year in San Juan County, Utah.

Pure's new well is the second at Southeast Lisbon. The No. 1 well flowed gas from the Mississippian and was the first indicated Mississippian production in Colorado. This well has not been completed.

The No. 2 Southeast Lisbon gives the Paradox basin its second Devonian producer. The other is the Northwest Lisbon discovery.


DEMAND AND CAPACITY FOR LUBRICANTS
Thousands of B/D
Forecast
Per Cent Increase, 1960 over 1959
PAD District | FRB Index | Demand
1 | 4.2 | 2.1
2 | 4.4 | 2.4
3 | 6.7 | 3.5
4 | 8.0 | 2.3
5 | 11.5 | 6.5
Local demand
Finished lube capacity

Small Lube-Demand Rise Seen

DEMAND FOR LUBRICANTS will increase this year. But the 1960 increase will be a lot less than the sharp jump made in 1959.

Demand this year will be up about 2.3%, according to J. A. Coble, manager of Socony Mobil's economics department. Coble made his prediction at the National Petroleum Association meeting in Cleveland last week. Last year's increase, he said, was 8%.

Coble pegged much of the reason for this year's increase on the continued gain in industrial activity. Lube demand follows industrial activity but tends to lag well behind. Both have risen since 1947, but while lube demand has gone up a bit over 20%, industrial production has risen close to 80%.

Even though demand shot up last year and may rise further this year, Coble warned against adding to capacity. Even with last year's gain, capacity exceeded demand by 28,000 bbl. per day.

He foresees a minor increase in capacity this year. It is expected to be less than the growth in demand with the result that a little more unused capacity may be needed in 1960.

While Coble expects demand to continue to increase through the years, he also foresees a gradually lessening rate. These are some of the reasons:

... **Export demand.** Capacity to produce is growing abroad and significant gains are scheduled for Europe and Latin America this year. These additions will raise foreign capacity to about 80% of foreign demand, thus limiting the export market.

... **Compact cars.** There have been predictions that compacts will account for as much as 30% of the 1960 model sales. Their average crankcase capacity is 15% less than that of the 1959 models and they have only 9 grease fittings against an average of 11.2 for 1959 models.

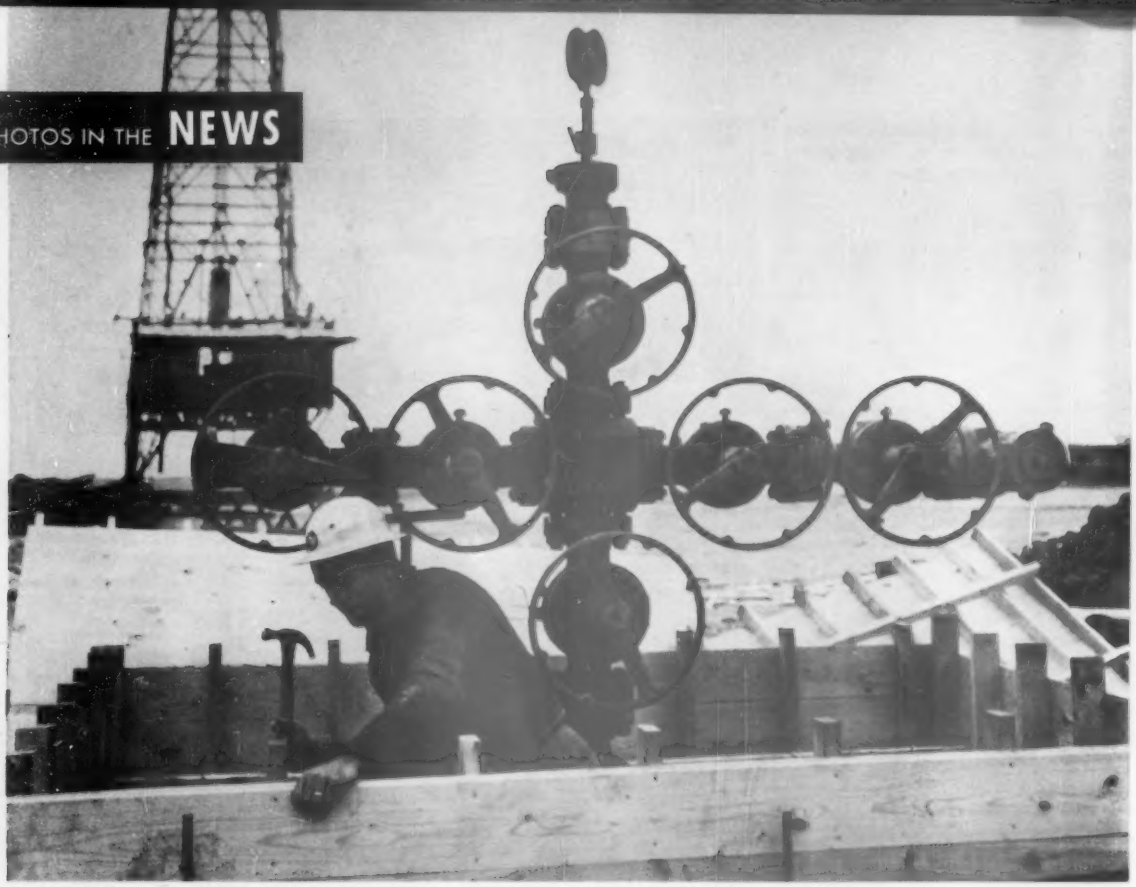
... **Synthetic lubricants.** Synthetics, says Coble, are making an "unmistakable dent in our business." He cited aviation, where 1 gal. of synthetic lubricant in a jet plane does what 50 gal. of petroleum lubes did in a piston plane.

... **Additives.** Use of nonpetroleum additives in lubricants is growing. Their proportion may run as high as 30% of the lubricant as in the case of marine diesel oils. They make better lubes but they add more to cost than to profit.

Coble pleaded for a more realistic attitude toward costs. "Every gallon of lubricants used in industry is doing more and more work and is thus becoming more and more valuable. We should be realizing some of that increased value in our selling price but, instead, the real price has gone down.

"How many companies represented in this room," he asked, "actually know the true costs of their lubricants? Such costs, of course, include not only the actual manufacturing costs but the expenses of marketing, distribution, engineering, and research as well. I suggest that if every lubricant manufacturer took the trouble to estimate his costs more carefully, lube oils would not be selling at the current low prices."

PHOTOS IN THE **NEWS**



Basin Buster?

MOBIL OIL field hand puts finishing touches to forms for concrete wall around wellhead of company's 1 Kathleen Moore in Pecos County, West Texas—a rank wildcat which Mobil feels has opened a new Pennsylvanian gas field of "really significant size." This well, together with a promising Atlantic Refining strike in the Devonian, a few miles away, may be the detonator needed to blast off a long-predicted exploration boom in the Delaware basin (OGJ, Mar. 7, p. 64). Another Mobil wildcat on the other side of the basin enhanced this possibility. This one, Mobil's 1 State-Barrett in northern Culberson County, was testing gas in the Morrow zone of the Pennsylvanian at 5,955-75 ft. Mobil now is drilling a confirmation to the 1 Moore, which produces from the Pennsylvanian at 15,041-15,147. The confirmation will go on down to test the Ellenburger—expected somewhere around 20,000 ft. Atlantic has taken its 1 Kelly deeper and last week was testing the Ellenburger.

Fiber-Glass Bottom

THE WORK these men are doing added up to a $6,000 saving on a single tank-bottom repair for Service Pipe Line Co. They are laying down a 1/16-in. fiber-glass matte over the badly corroded steel bottom of a 107,000-bbl. tank at Drumright, Okla.

The alternative would have been to install a new—and more expensive—bottom of steel or concrete. Both materials and installation would have cost more.

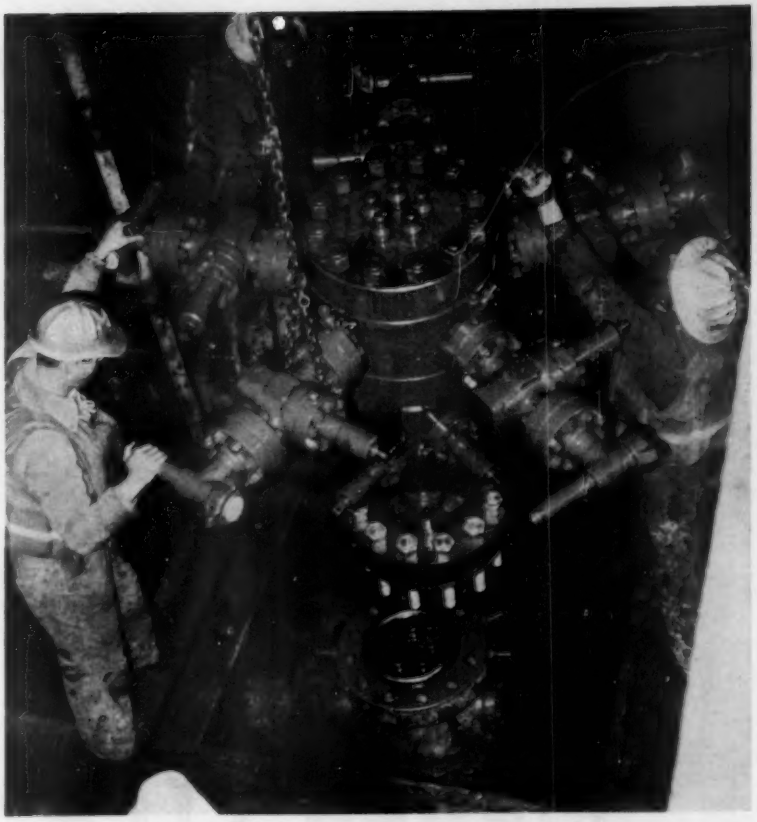
Similar glass-plastic repairs have been reported by other companies with savings of half the normal expenditure (OGJ, July 21, 1958, p. 97). Tank superintendent Merle Carter devised his own method for this job, after testing to ascertain chemical resistance and strength of materials.

Five-String Tree

A CHRISTMAS TREE swings into position during the oil industry's first quintuple completion. Sinclair Oil & Gas Co. scored this industry first at its well in Block 190, Eugene Island area, off Louisiana.

The 7,981-ft. well has been completed in six zones, five of which may be produced simultaneously. The tree was designed, assembled and tested at the Houston plant of the National Supply Co. The master valve assembly consists of two Cameron Iron Works quintuple ported block valves.

On calculated open-flow potential tests the six zones produced at the rate of 492 million cubic feet of gas per day (OGJ, Apr. 18, p. 77). A detailed engineering report on the well will be published in the May 2 issue of the Journal.



Spring Sprouts

VEGETABLES that have grown through an asphalt covering are checked by a research scientist at the Esso Research & Engineering Co. laboratory in Linden, N. J.

The asphalt was sprayed over the soil after it was seeded. The thin film prevents moisture in the soil from evaporating. It is believed that this method has a great potential in arid areas.

A field testing of special agricultural asphalt blends has been started by Esso in conjunction with the University of Arizona at a farm test site in Tucson.

YOUR *FISHER/MAN* STANDS BEHIND THIS

FOR Inherent Accuracy–Power–Speed–and Stability

FISHER TYPE 470 P.O.P.

- Delivers same power in either direction at any point of the stroke.
- No air set required—utilizes clean, noncorrosive air or gas up to 150 psi.
- Adaptable to virtually all types of valve bodies including Butterfly valves.
- Easily reversible actuator can be changed in the field.

This small, compact, pneumatically operated piston is available in five sizes with yoke sizes to fit any of the Fisher valve bodies including Butterfly valves. P.O.P. acts with high speed. For example, the 8½-inch size gives you 1.5 inches per second stroking speed. Write Fisher Governor for Bulletin E-59.

Available with large variety of accessories such as: spring return, side mounted handjack, hydraulic snubber and pneumatic safety return devices. Write for Bulletin E-470.

Type 470 P.O.P. With Fisher Bodies				
Cylinder Size, Inches	Yoke Boss Size, Inches	Valve Body Size, Inches	Stem Size, Inches	Allowable Stem Force, Lbs.
4¾	2⅛	½—1½	⅜	1,500
	2 13/16	2—4	½	*
	3 9/16	5—8	¾	*
6⅛	2 13/16	2—4	½	2,500
	3 9/16	5—8	¾	*
8½	3 9/16	5—8	¾	5,000
10¾	5	10—16	1	8,000
13	5	10—16	1¼	12,000

*Limitation with these stems is dependent upon the maximum force available from each cylinder.

See chart in figure 3.

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD . . . CHANCES ARE IT'S CONTROLLED BY . . .

FISHER GOVERNOR COMPANY

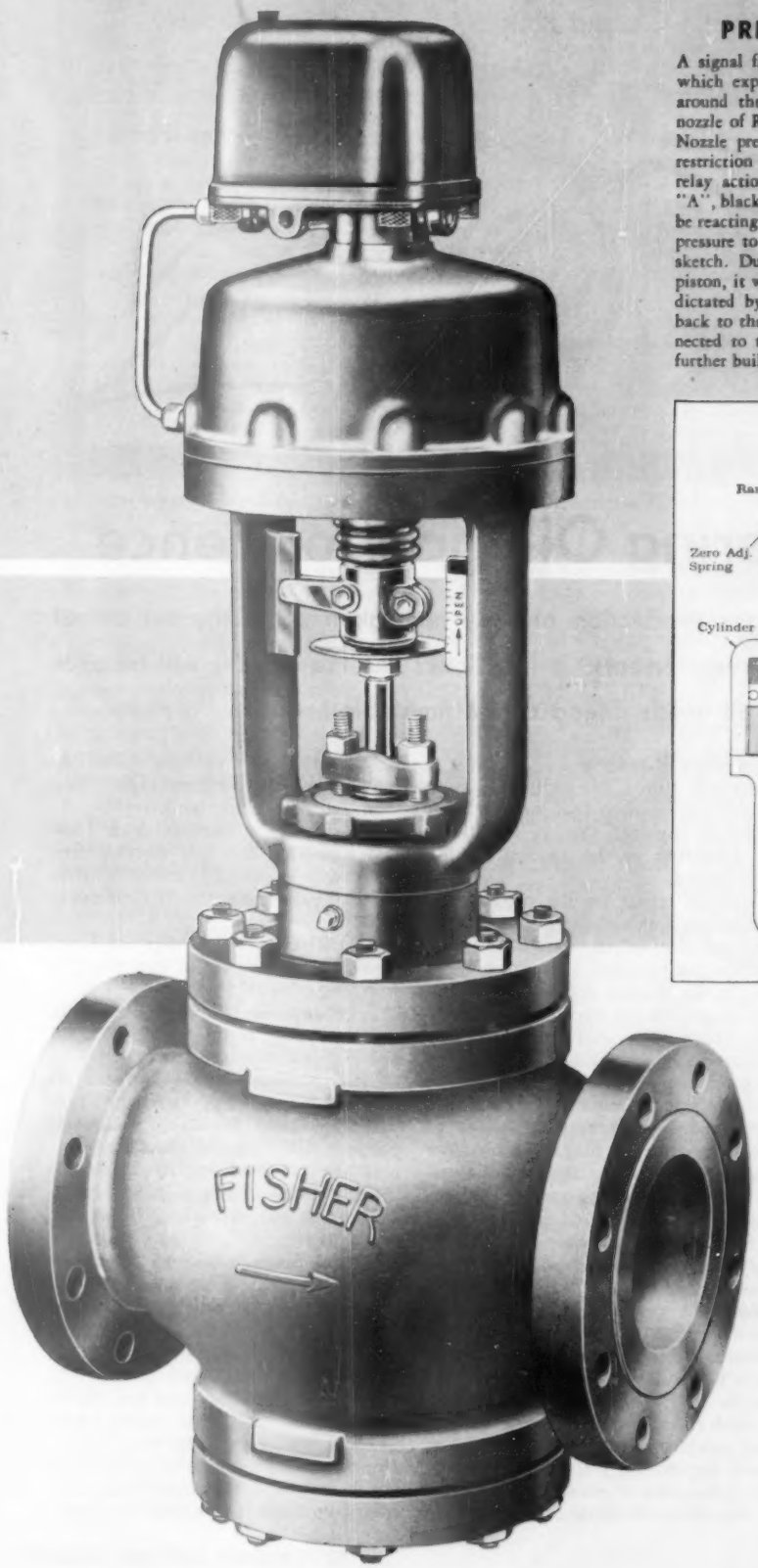
Coraopolis, Pa. / Woodstock, Ontario / London, England

Main Office and Plant: MARSHALLTOWN, IOWA

FISHER® Controls

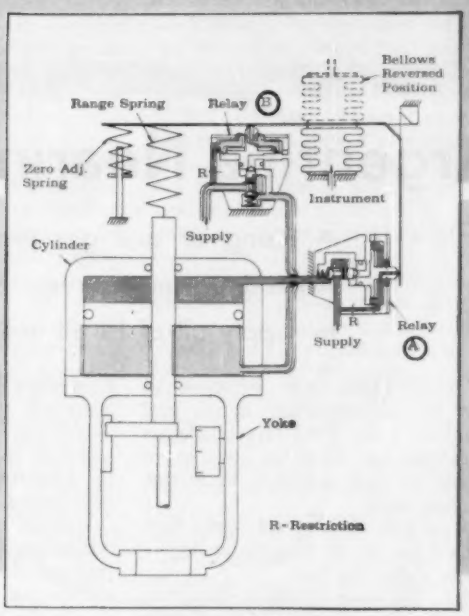
SINCE 1880

PNEUMATICALLY OPERATED PISTON...

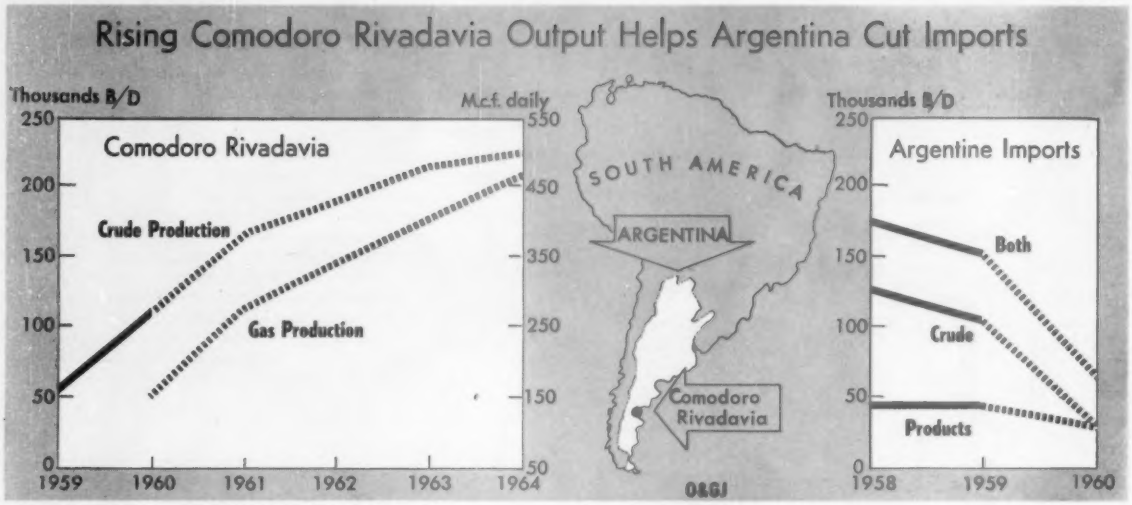


PRINCIPLE OF OPERATION

A signal from the controller is received by the bellows which expand to move the beam. The beam will pivot around the fixed point and simultaneously uncover the nozzle of Relay "B" and cover the nozzle of Relay "A." Nozzle pressure will increase in Relay "A" due to the restriction created by the beam over the nozzle. Through relay action, the air pressure to the top of the piston, "A", black in the sketch, will be increased. Relay "B" will be reacting to the change in beam position to decrease the pressure to the under side of the piston, "B", red in the sketch. Due to the unbalanced pressures acting on the piston, it will move down, changing the valve position as dictated by the controller. The piston movement is fed back to the beam by means of a range spring that is connected to the piston rod extension, thus preventing any further build-up of pressure in the cylinder.



Exterior view of high pressure actuator. Type 470 mounted on a Design "A" body.



Argentina Nearing Oil Independence

● Rising oil and gas production already has taken a healthy cut out of Argentina's import requirements. It now looks like the country will be able to supply all of its oil needs ahead of the timetable set up.

ARGENTINA now promises to meet its self-sufficiency in oil goal long before the 1964 target date set 20 months ago when the government granted its first contracts to foreign oil companies.

Developments in recent weeks have jumped the rate of progress in Argentina in a startling way.

Here are some of the eye-openers:

. . . **A new evaluation** of the Comodoro Rivadavia basin by a United Nations consultant indicates 1960 production from this area will more than double last year's output. This one basin, where three drilling contractors plan to complete 1,800 wells, will be producing almost 225,000 bbl. daily by 1964—a jump of 315% over 1959.

. . . **New pipeline outlets** for only two of the country's producing areas have already started new oil flowing to Argentina's hungry markets.

. . . **Costly oil imports** that have sapped Argentina's currency reserves at a $300,000,000 annual clip have already slowed to a mere trickle.

The only possible hitches in a bright oil future for Argentina would be political upheaval from a people smarting under a severe austerity program of the present government, or difficulty in making pipeline construction keep pace with rising production.

Comodoro Rivadavia . . . Almost 5 years ago, the U.N. technical assistance administration sent an American reservoir engineer, George R. Elliott, to Argentina at the request of the government.

Elliott's report on the oil and gas condensate fields of the northern Salta province resulted in construction of a natural-gas line and a products pipeline to the Buenos Aires region. The two lines were put into operation early this month (OGJ, Apr. 11, p. 103).

Early this year Elliott returned to Argentina, again representing the U.N. and again at the request of Argentina's government. This time he looked at the Comodoro Rivadavia basin region and came up with a detailed analysis of the area's prospects up to and including 1964.

Some of Elliott's conclusions of this, only one of five primary producing areas of the country, are a little startling. The conclusions are based on the development already done by Yacimientos Petroliferos Fiscales and private contractors, and the prospects for the future.

Here are Elliott's projections for oil and gas from the Comodoro Rivadavia region:

. . . **Reserves of gas** so far developed in the old south flank of the basin as of January 1 this year were 56,223,000,000 cu. meters (just slightly less than 2 trillion cubic feet).

. . . **Future gas reserves** as of 1964 and based on the new development areas will be 160,223,000,000 cubic meters (more than 5½ trillion cubic feet).

. . . **Oil reserves** in Comodoro Rivadavia, as of the first of this year, of 731,753,000 bbl.

. . . **Future oil reserves,** as of 1964 for the same region, 2,102,973,000 bbl.

. . . **Production** figures for both oil and gas are just as startling. This year Comodoro Rivadavia basin will produce 4,328,000 cu. meters of natural gas (153,000 M.c.f. daily). By the end of 1964, this will increase to 13,270,000 cu. meters daily (468,000 M.c.f. daily).

. . . **Oil production** from the basin during that same period is on an equally sharp upward curve. The old developed fields produced 8,594 cu. meters of oil daily during 1959 (slightly more than 54,000 bbl. daily). This year the basin will account for 17,778 cu. meters daily (or more than 111,800 bbl. daily). The 1960 output from this basin alone is more than all Argentina's producing areas furnished the country last year. By 1964,

the oil output from the basin will reach almost 225,000 bbl. daily.

All Elliott's predictions are based on YPF work in the old south flank producing fields, plus new work already contracted to be done in the "new discovery" region of the south flank and the north flanks of the basin.

Results from the Elliott study apparently is spurring Argentina's plans to build a natural-gas line from Comodoro Rivadavia northeastward to Buenos Aires via Bahia Blanca.

YPF plans to ask for bids this month on the large-diameter 1,791-km. (1,113 mile) line from Canadon Seco in the Rivadavia area to Buenos Aires.

Capacity would be 247,000 M.c.f. daily, with facilities to increase that to 353,000 M.c.f. daily. Compressor stations on the line would have a total of 136,000 hp. Estimated cost is $230 million.

New pipeline outlets . . . Within the last 30 days, Argentina has been able to tap earlier established producing fields for more of its hydrocarbon energy requirements. In each case, the additional oil and gas supply has been a real shot in the arm for the country's energy requirements.

Early this month, President Arturo Frondizi took part in the official ceremonies opening the 920-mile 12-in. system built to move unfinished products from the Salta fields to the San Lorenzo refinery on the Parana River above Buenos Aires (OGJ, April 11, p. 103).

Design capacity of this system is about 58,000 bbl. daily. It will move almost 35,000 bbl. daily of 52°-gravity distillate from the Salta fields, some of it coming from Madrejones wells on the Bolivian side of the border. Additional light products in the form of butane, gasoline, and kerosine will move through the line from the Campo Duran region.

Alongside this light-liquid system, a 22 and 24-in. natural-gas line has been laid from south of the products terminus directly to Buenos Aires, a total of 1,100 miles. When the additional pump stations needed are completed, this line can move 243,000 M.c.f. of gas daily into the Buenos Aires market.

This gas system, if coupled with the proposed natural-gas line to tap the 1964 gas potential of Comodoro Rivadavia basin, could furnish Buenos Aires with daily gas supply of at least 700,000 M.c.f. daily if not another single gas-supply well is drilled in the Salta region.

YPF also will seek bids this month on a 1,404-km. (872-mile) 22 and 18-in. natural-gas line from Metan, on the Campo Duran-Buenos Aires line, to Buenos Aires via Resistencia and Rosario.

The line would have a capacity of 140,000 M.c.f. daily, compressor stations with a total of 76,000 hp.

It initially would transport 53,000 M.c.f. daily from Bolivian Oil Co. on the Bolivian side of the Campo Duran structure. That eventually would be stepped up to 140,000 M.c.f.

In addition to the oil and gas supply already tapped in the north, Pan American International this month opened a new 12 and 14-in. pipeline linking its Comodoro Rivadavia producing area to the Argentine coast. The 83-mile crude pipeline has a design capacity of 50,000 bbl. daily and will boost the Pan Am contribution to Argentina's crude supply from about 4,500 bbl. daily to at least 25,000 bbl. daily overnight.

Pan American, one of the first company's to obtain a development contract with YPF, expects to have its first 150 wells in the north flank region of Comodoro Rivadavia completed by mid-1960.

Crude lines now under construction by Esso and products lines linking the Lujan de Cujo refinery at Mendoza and Buenos Aires will increase the potential output of the country sooner than was first expected.

YPF imports halted . . . More than 2 months ago YPF was able to score a psychological victory in Argentina when it announced that the government company would no longer import crude oil (OGJ, Feb. 15, p. 81).

This was followed closely with some officially released figures to answer internal criticism of the action.

YPF's original contract, calling for the purchase of 900,000 long tons of Kuwait oil from British Petroleum, was revised to provide for a minimum purchase of 300,000 long tons of diesel oil and gas oil. The new purchase contract calls for an average of 34,000 bbl. daily of product imports.

Compared with imports for the past 2 years, it's almost nothing. YPF President Horacio Aguierre Legarreta revealed the official figures a few weeks ago. In 1958, Argentina's government company imported an average of 130,140 bbl. daily of crude, plus 48,000 bbl. daily of products, for a total of 178,400 bbl. daily.

The following year, 1959, YPF imported 104,500 bbl. daily in crude and added another 48,500 bbl. daily in products for an annual average of 153,000 bbl. daily.

The 1960 average of 34,000 bbl. daily in products looks pretty small in comparison.

An even more heartening fact for YPF is that it will not only stop crude imports this year, but will also contribute to a reduction of crude imports on the part of Esso and Shell, both of whom refine and market in the country.

YPF estimates it can furnish the two private companies an average surplus of 34,500 bbl. daily this year to cut the anticipated crude imports of both companies about in half if local consumption does not take a big jump over 1959.

Refinery construction projects now planned or already under way will increase the country's processing capacity, both government-controlled and private, to more than 310,000 bbl. daily in 1962. This throughput compares with slightly more than 250,000 bbl. last year.

Internal demand in 1959 in Argentina was on the order of 264,000 bbl. daily. With an estimated refining capacity of 310,000 bbl. daily by 1962, and an estimated productive capacity of more than 360,000 bbl. daily in 1964, the country will not only be meeting its own needs, but it will be exporting crude long before the target date.

India Plans Refinery in Cambay Area

INDIA plans to build a 10,000 to 20,000-bbl. refinery in the Cambay area to handle production from a new field found with the help of Russian and Romanian equipment and personnel.

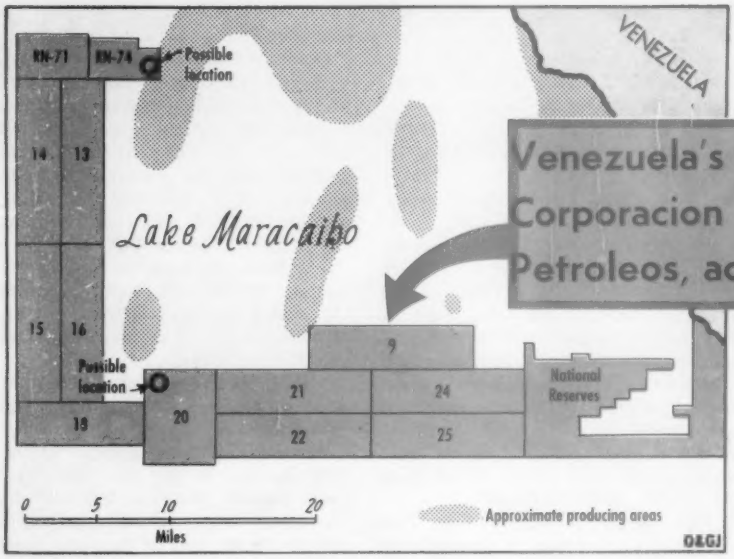
K. D. Malaviya, minister for mines and fuel, said planning for the project will start at the end of the year when a better appraisal of the field's potential will be possible.

The government's Oil and Natural Gas Commission has drilled five producing wells near Lunej, in the Cambay region. Malaviya said 150 to 200 development wells are planned.

The discovery, drilled 2 years ago, found three oil-bearing zones, between 5,492-5,610 ft., 5,658-5,697 ft., and 5,727-5,756 ft. The latest well found oil at about 5,085 ft.

Russia is hailing the find as a triumph for Soviet technical aid. M. Antropov, Soviet minister for minerals and geology, toured the field and commented it could support a 40,000-bbl. refinery.

The Russian press has made a meal of the fact that all five well locations were selected by Russian specialists who, along with Romanians, have been running the program for India.



Venezuela's new oil company, Corporacion Venezolana de Petroleos, acquires vast acreage

New company will be run by the Ministry of Mines and Hydrocarbons. But it will be operated as a separate entity, with no connection with the Venezuelan treasury.

Venezuela Realizes a Pet Project

. . . an integrated, government-owned oil company

VENEZUELA is alive with the biggest wave of exploration rumors since the awards of concessions in Lake Maracaibo 3 years ago.

The reports are again centering around Maracaibo, and, if true, could mean as much to the oil industry as the awards to a string of newcomers in the late 1950's.

They were spurred by the fact that the government has definitely made up its mind on the concessions to be granted to the new government-owned oil company.

The exact concessions have been kept under wraps. The best guess for the reason behind the secrecy is that President Romulo Betancourt wants to reveal the details personally when he formally announces plans for the company.

This was expected to take place April 19 during the celebration of the 150th anniversary of throwing off the Spanish rule. On that date, however, the Venezuelan Government was much concerned with an "invasion" of rebels along the western border.

The acreage . . . The word is that the new national oil company, Corporacion Venezolana de Petroleos, has been given a wide strip of acreage ringing the border of the concessions awarded in the grants 3 year ago.

The rights cover no fewer than 14 blocks and national reserve tracts. These are Blocks 9, 13, 14, 15, 16, 18, 20, 21, 22, 24, 25, national reserve tracts Nos. 71 and 74, and the national reserve acreage lying to the south and east of Lower Lagunillas reservoir. (See related story on p. 126).

These tracts adjoin the prolific production developed in the lake in the last 3 years. This includes the rich oil pools found by Superior Oil, Sun Oil, Signal, and Phillips, along with new output found by the established lake operators, Creole, Shell, and Mene Grande.

Caracas oil men say the Venezuelan Government will waste no time in drilling its first well at one of two possible locations. One site is on RN-74, just across the concession line from Superior's flush national-reserve tract. The other possible location is in the northwest corner of Block 20, a short distance south of wells drilled by Phillips on Block 17 and Shell on Block 8.

Both Phillips and Shell have been drilling in their southern tracts, Blocks 17 and 8. In fact, they have been waging an offset-drilling scrap for months (OGJ, Oct. 5, 1959, p. 119). The production developed in these two tracts is the southernmost in the middle of the lake.

National Oil Co. . . . An integrated, government-owned oil company has been one of the pet projects of the present Venezuelan administration.

Plans have been in the works almost from the day it took office. The company was considered important enough to time its official launching with the April 19 celebration of the 150th anniversary of the ejection of the last Spanish ruler from Venezuela.

The new company will be run by the Ministry of Mines and Hydrocarbons. But it will be operated as a separate entity, with no connection with the Venezuelan treasury.

Venezolana will be financed through the income from government-owned natural-gas pipelines from Anaco to Caracas and from Caracas to Valencia, along with subsidiary properties. It also may be financed by direct aid from the government.

The law setting up the new company also specifies that the firm will be financed by specific exploitation concessions. The exact acreage, however, while already selected, was not made public.

Venezolana was set up to engage in every branch of the oil business: Exploration, production, refining, and both domestic and foreign marketing. It can set up appropriate subsidiary companies, and has permission to buy part ownership in established oil companies. As an independent financial entity, it has the authority to make loans and float bond issues.

France Unveils Its New Marketing Company

- Final organization shows it underwent some changes reflecting at least a partial victory for private firms.

PRIVATE interests scored at least a partial victory in their efforts to avoid a government marketing monopoly in France.

The new government-sponsored French marketing company was unveiled last week in far different form than originally proposed.

The country's big official oil agency, Bureau de Recherches de Petrole, will have no part in the new company directly. Even the name of the new concern, designed to market Saharan oil, has been changed.

The French Government created the new company last week and called it Union General des Petroles. No reason was given for the change from the planned Societe Industrille des Petroles.

As originally planned the Caltex French refining and marketing company will be the cornerstone of the new firm. One-third interest will be held by Regie Autonome des Petroles, the government-owned holding company which, in turn, has interests in several operating companies, among them CREPS, which has production in eastern Algeria. Another one-third interest will be held by SN Repal, which is controlled by BRP's 40% interest but does have private capital. The remaining one-third will be split among other French companies which have stabilized production both in metropolitan France and in Africa.

The fact that the government agency BRP was left out except for its indirect interest through the other companies was regarded in Paris as a victory for supporters of at least semiprivate enterprises.

Opponents of the original marketing scheme charged openly that BRP aimed at creating a French monopoly similar to Enrico Mattei's ENI in Italy. There was widespread speculation that BRP intended the new marketing venture to eventually take over all private marketing in France.

The government announcement last week stressed that the new company will be placed on a commercial level of other companies—competitive without discrimination in its favor.

"Other groups will be able to conclude freely agreements with it."

The government did point out that it plans to urge all companies operating in France to buy crude from national producers to insure that each year a "reasonable" amount of Franc zone production will go to make up French oil consumption.

The volume of these purchases of Saharan oil by private French marketing companies is still very much a matter of discussion. Paris speculated last week that cooperation of private marketers with the newly formed Union General des Petroles will determine whether it remains small or becomes a giant by absorbing more independent marketers, as some government quarters still advocate.

Mobil Hits Again in Libya

MOBIL International has brought in its second discovery in Libya. The company's Hofra 2 on test flowed 1,500 bbl. daily of 43° gravity crude from about 3,030 ft.

The discovery is about 80 miles south of the Mediterranean Coast, and 360 miles southeast of Tripoli. It is on Block 11, covering 4.7 million acres.

Hofra 2 lies just south of Oasis' prolific Block 32. Oasis is developing Dahra field in the southern part of the block.

The best Oasis well, F-2-32, is a few miles northwest of the Mobil find. But the first Hofra well, lying between the two producers, is a dry hole. The F-2-32 tests 8,000 bbl. daily of 43° gravity crude from a 64-ft. section at 3,086-3,150 ft., and a 20-ft. section between 3,160-3,180 ft.

Mobil's first find was made at Amal 1 late last year. The well flowed 865 bbl. of 34° gravity oil on a 24-hour production test from 9,841-10,405 ft. Amal is the easternmost find in Libya, located about 190 miles southeast of Bengasi, and about 100 miles from the coast. It is on Block 12.

Hofra 2 is the twelfth well drilled in Libya by Mobil's affiliate. The company has 75% interest in 21 million acres of concessions in the country. Gelsenberg interests of Germany hold the remaining 25%.

Another Arabian Wildcat Looks Good

A SERIES of oil shows has been encountered in Murban 3 wildcat being drilled within a few miles of the Persian Gulf in the shaikdom of Abu Dhabi.

Petroleum Development (Trucial Coast), Ltd., the Iraq Petroleum Co. affiliate working in this section of Arabia, said that several interesting shows of oil were found below 8,400 ft. The location is 5 miles southwest of the town of Abu Dhabi, and 7 miles west of Murban 2, abandoned last year.

Tests on the well have already started. These will take several weeks. If they are encouraging, the company plans to carry out more drilling on the structure, which already has been drilled, off and on, for years.

The first Murban well came in as a 1,500 bbl. daily producer. It failed to flow, however, when retested after mechanical trouble delayed operations. Murban 2 was abandoned at 10,585 ft. last year after reportedly flowing at the rate of 2,000 bbl. daily on tests.

Abu Dhabi already appears destined to become the Middle East's newest oil country. Abu Dhabi Marine Areas, Ltd., owned by British Petroleum and Cie. Franciase des Petroles, has set plans in motion for commercial development of Umm Shaif, an offshore field 70 miles out in the Persian Gulf.

A 20-mile submarine line will be built from Umm Shaif to Das Island (OGJ, Apr. 18, p. 99).

Rundown on Maracaibo's Lower Lagunillas Reservoir

	Wells	PRODUCTION Dec. 1959 Oil Total Bbl.	Gas M.c.f.	Water Bbl.	CUMULATIVE PRODUCTION To Dec. 31, 1959 Oil Bbl.	Gas M.c.f.	Water Bbl.
Shell	51	4,196,587	5,691,789	13,662	50,042,677	59,235,473	152,141
San Jacinto	15	1,286,257	1,433,486	14,379	14,766,369	13,386,642	136,538
Creole	11	5,837	5,148	8	13,003,504	11,603,424	15,438
Mene Grande	16	785,951	882,295	6,638	7,851,755	6,886,302	19,892
Total	**93**	**6,274,632**	**8,012,718**	**34,687**	**85,664,305**	**91,111,841**	**324,009**

Maracaibo Has Unitization on Giant Scale

- Each of four companies will handle own production on equity basis in pact covering output from Lower Lagunillas pool in Bachaquero field.

THE WORLD'S largest unitization propect has gone into operation in Lake Maracaibo.

Four companies have signed an agreement prorating production from Lower Lagunillas reservoir in the southwest part of Bachaquero field. The unit operation will control production of an estimated 630 million barrels of primary reserves. Initial production on the 13,200-acre tract is about 200,000 bbl. daily.

The four Venezuelan companies and their share of production are: Shell de Venezuela, 60.46%; San Jacinto, 16.19%; Creole Petroleum, 13.67%; and Mene Grande, 9.68%. San Jacinto, in turn, is operator on a 1,967-acre tract held with five other partners. These are Tennessee-Venezuela, Union Petrolera Venezolano, Monsanto Venezuela, Murphy-Venezuela, Sharples Oil, and Petrofina.

The agreement covering the 10 by 3-mile producing strip has features that make it unique. Unlike the typical U. S. unit, Southwest Bachaquero follows the normal Venezuelan pattern in which each company handles its own production.

This is because the participating companies have other concessions nearby that must be operated regardless of the unitization project. The economy of using a unit operator would be much less than in areas where leases are small and ownership is widely divided.

But the Southwest Bachaquero unit also has an offtake formula that provides some flexibility in production rates. In contrast to many units where companies divide all production on an equity basis and must agree on rates, Southwest Bachaquero members, basically, can produce up to their equity of the maximum efficient production rate of the reservoir. The MER, set by a committee of company representatives, is reviewed every 6 months by the unit members.

If one company becomes deficient, however, it can take 10% of total offtake until the deficiency is made up. In the meantime, the other companies can produce their equity of the remaining 90% of production. The deficient party at the same time can also have its full share of the 90%.

If two or more companies are deficient and wish to make up their share of production, they share the 10% in ratio to their equity.

The agreement also was made without a prior decision on secondary recovery. The reason is the belief that ultimate recovery can be raised by unit operation, through more efficient use of gravity drainage, even without fluid injection. But the parties will look into secondary recovery methods later.

Lower Lagunillas reservoir has an average net sand thickness of 150 ft. The crude is about 27° gravity.

FOREIGN BRIEFS . . .

A 250,000-bbl. crude stabilizer will be installed at Kirkuk field by Iraq Petroleum Co. Contract for the $1.4-million unit has been awarded to Foster Wheeler, London. The stabilizer will be the twelfth, and by far the largest, at the field.

A 6,000-bbl. Houdriformer and an 8,000-bbl. hydrodesulfurization unit will be built at Mizushima, Japan, by Nippon Mining Co. under license from Houdry Process Corp. The reforming unit will process 6,000 bbl. daily of desulfurized naphtha, while the remaining 2,000 bbl. daily from the desulfurizer will be used for jet-fuel blending and specialty naphthas. Completion is scheduled for mid-1961.

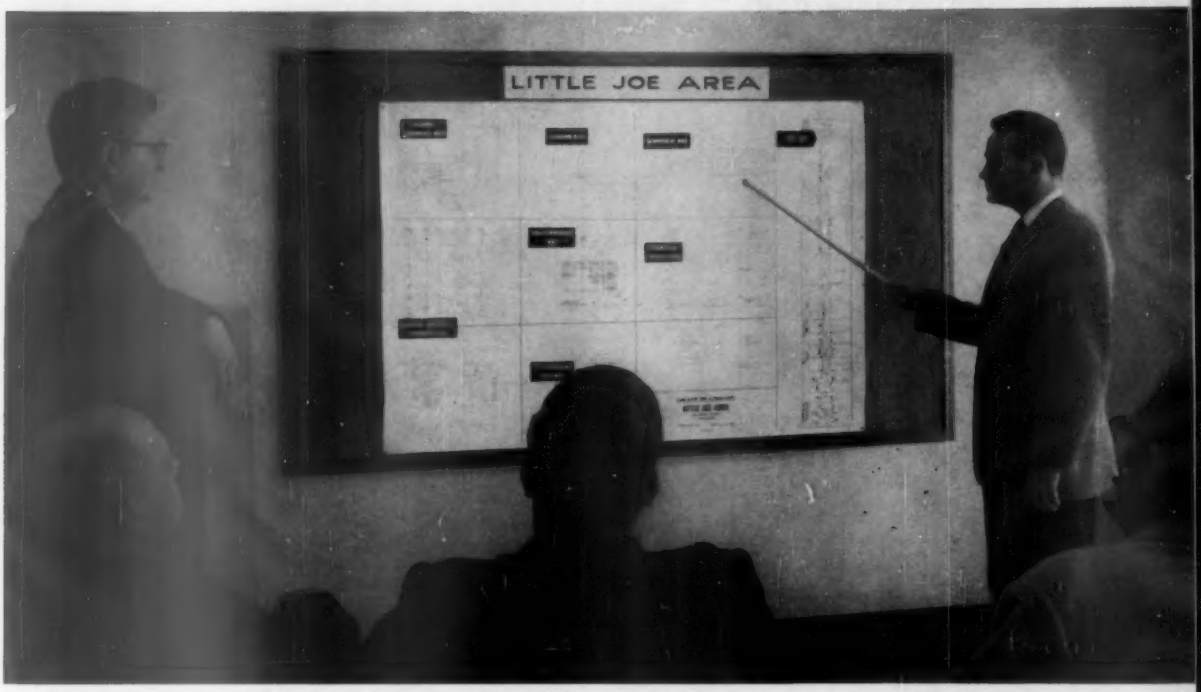
Italy's ENI has set up a marketing subsidiary in Munich for the purpose of building or buying a chain of retail outlets in Bavaria. The company is a leading contender among rival groups seeking to build crude pipelines into southern Germany.

Imperial Chemical Industries will spend $28 million for ammonia and ammonia product units at Severnside, England. The facilities for making 100,000 tons per year of ammonia, urea, and fertilizers will open in 1963. Another Severnside project is a 35,000-ton per year ethylene-oxide plant of Scientific Design Co., Inc., design. The unit will be fed by a 70-mile ethylene pipeline from Esso Petroleum's Fawley refinery.

The Delhi-Frome-Santos group last week abandoned its second deep duster in Australia—the 1 Betoota in Quensland at 9,824 ft. Delhi Australian, operator, said the decision to abandon the well was based on its penetrating an unfavorable section which made it unlikely that oil would be found below the final total depth. The group's first deep test, the 1 Innamincka, was completed dry near the Queensland border in northeastern South Australia last year.

Special
EXPLORATION
Section

. . . New tools and techniques today's oil hunter is finding useful, plus an area-by-area look at where oil is being found and where hot spots will likely flare in coming months.



HERE IS THE END RESULT, the montage print, being discussed in conference.

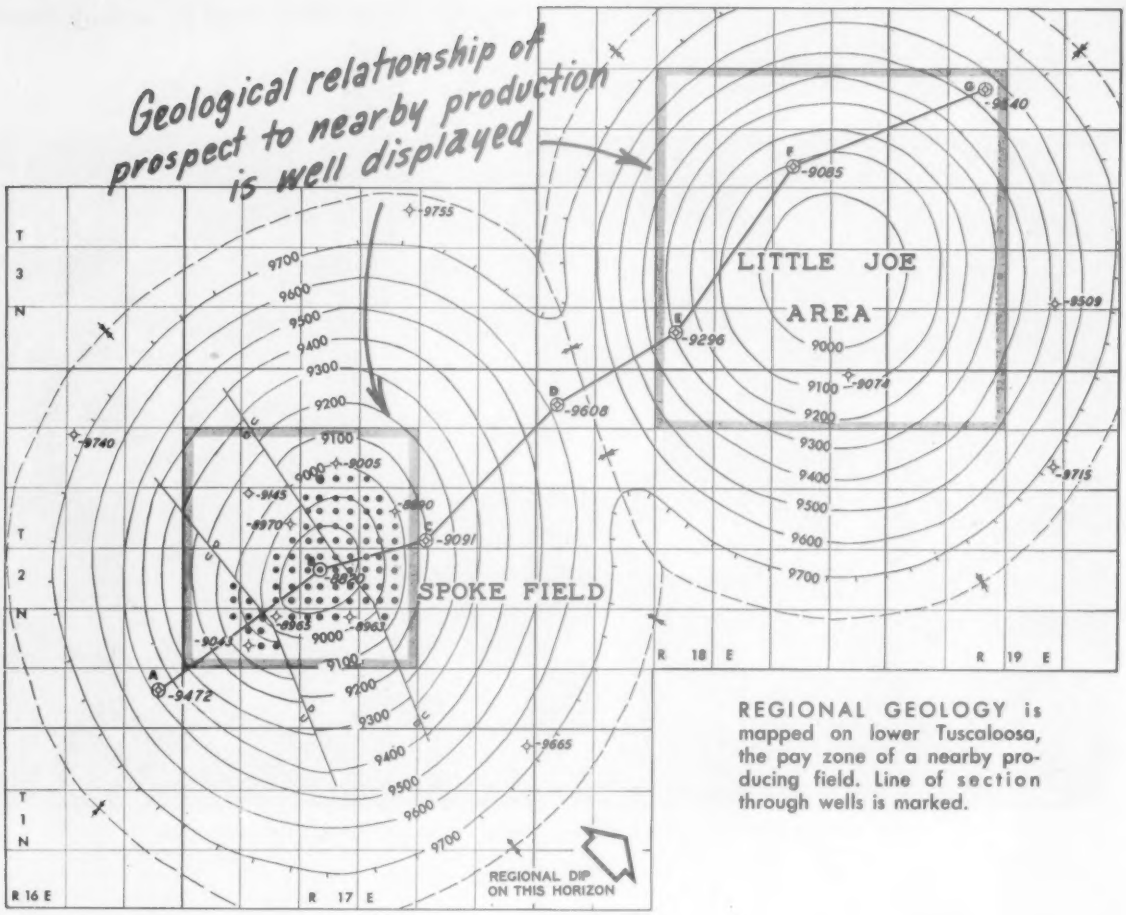
"Montage" technique makes for quick decisions in

Evaluating a drillable prospect

Here's a simple method for compiling and presenting all the data necessary to evaluate a drillable prospect. The montage technique is minutely described so that any company can learn exactly how to go about using it.

The montage technique calls for a composite assemblage of both visual and statistical data pertaining to an area under appraisal. The prime question is, **should this area be drilled now?**

The sole purpose of the montage is to provide management and exploration people a **single** visual package that will answer **all** questions that arise concerning a specific area. Conference time is valuable, yet necessary to size up the situation. Why, then, continue to thumb through folders and files to pull maps and data to answer inquiries and support statements, when a montage will save time and effort and do a better job?



REGIONAL GEOLOGY is mapped on lower Tuscaloosa, the pay zone of a nearby producing field. Line of section through wells is marked.

The montage is a package of components; in the package, we find maps, cross-sections, a type log; also supporting cost data pertaining to land, drilling, and geophysics, and typical production figures. The costs are tabulated and presented in the display, along with pertinent technical data.

Let's discuss components and how montage is made . . .

The basic map must show regional subsurface geology. The scale is important. It may vary from 1 in. = 4,000 ft. to 1 in. = 1 mile. A suitable scale is one that will show the relationship of the target prospect to actual nearby production; preferably this should be a field producing from a section believed present in the area being evaluated.

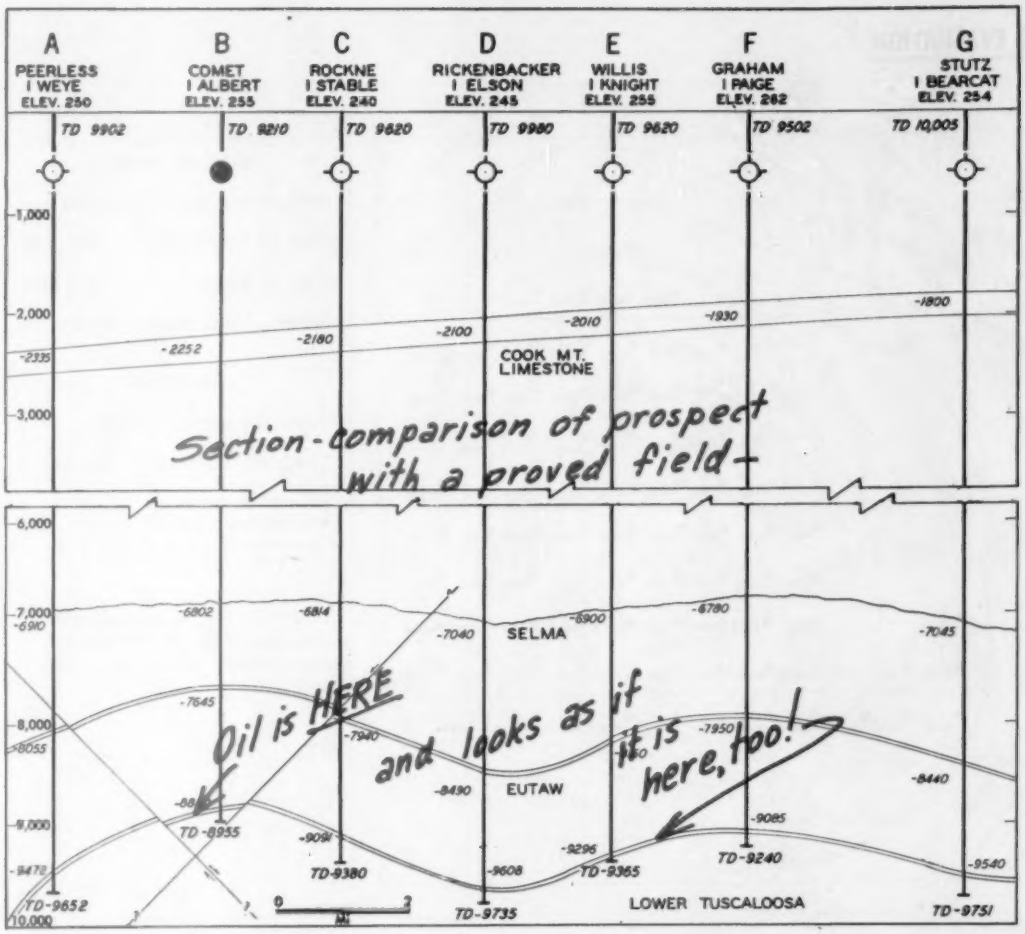
The subsurface geological map should display the following information: direction of regional dip on the mapped horizon, name of the contoured horizon, a line of section through key wells or tests, proximity to a producing field, and pattern of existing production. This pattern should be clear but not too detailed as a map of the field is prepared later.

We don't really need title boxes on each map. Instead, the margins can be used for such incidental information.

The case for omitting the title box and using the margins is a strong one. Symmetry is better. There is no box hanging below the art presentation and all white space can be used advantageously. This also allows a larger scale, and thus more detail.

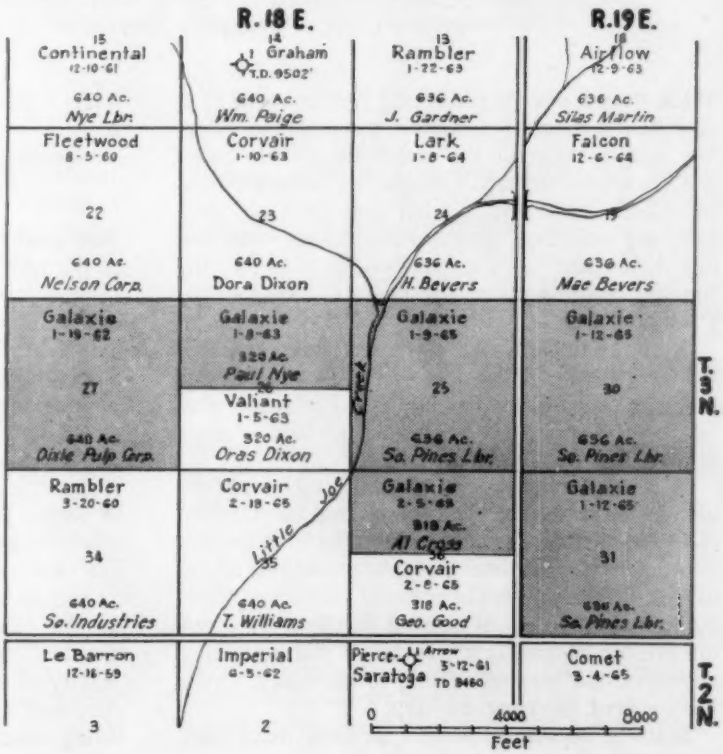
The areas outlined in the subsurface map above are the areal limits of two maps to follow. They are the type producing-field map and the geophysical (in our example seismic) map. These are discussed later.

The horizon mapped is the top of lower Tuscaloosa and the contour interval is 100 ft.

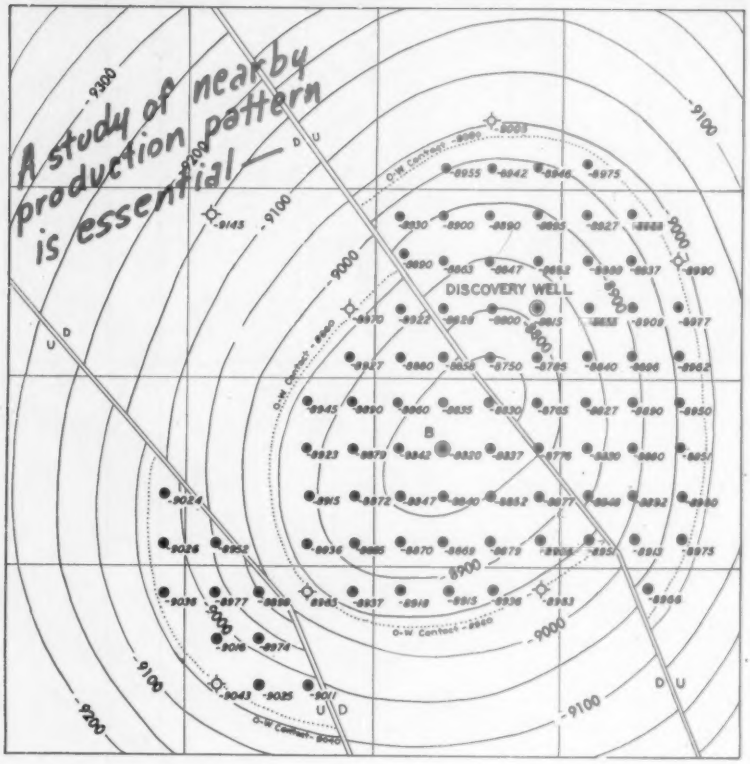


GEOLOGIC CROSS-SECTION points up the areas of interest and provides all well data.

The geologic cross-section comes next. Its vertical scale is chosen for clarity and expression of structure. If necessary, parts of the section are omitted by using a break symbol. Horizontal scale should agree with the map above it so straight-line projections from wells on the map are drawn to their positions on the section. The land plat shows company acreage, expiration dates, landowners, and acres in each tract.



LAND PLAT should allow the smallest area possible with all company acreage apparent.



DRILLING COSTS	
Cost of dry hole:	$110,000
Cost of flowing well:	$155,000
Cost of pumping well:	$175,000
Optimum total depth:	10,200 ft.
LAND DATA	
Total net acres:	3,186
Total net land cost:	$21,670
Date of earliest expiration:	1-8-63 Acres: 320

TYPE FIELD map, on top of lower Tuscaloosa, tells a lot without being cluttered. Avoid too much detail.

What does a nearby producing field look like? A type field is the next element of the montage. Number and position of the wells are shown, along with structural aspects. The spacing pattern should be readily apparent. Gas-oil and oil-water contacts are indicated. Subsea values of all wells and dry holes are marked legibly. If desired, the amount of throw along the faults is shown at various intervals.

In the example above, a structure map is drawn on top of lower Tuscaloosa-Cretaceous. In some cases an isopach map of the pay formation may be more useful. Use the type map that is most appropriate for appraisal.

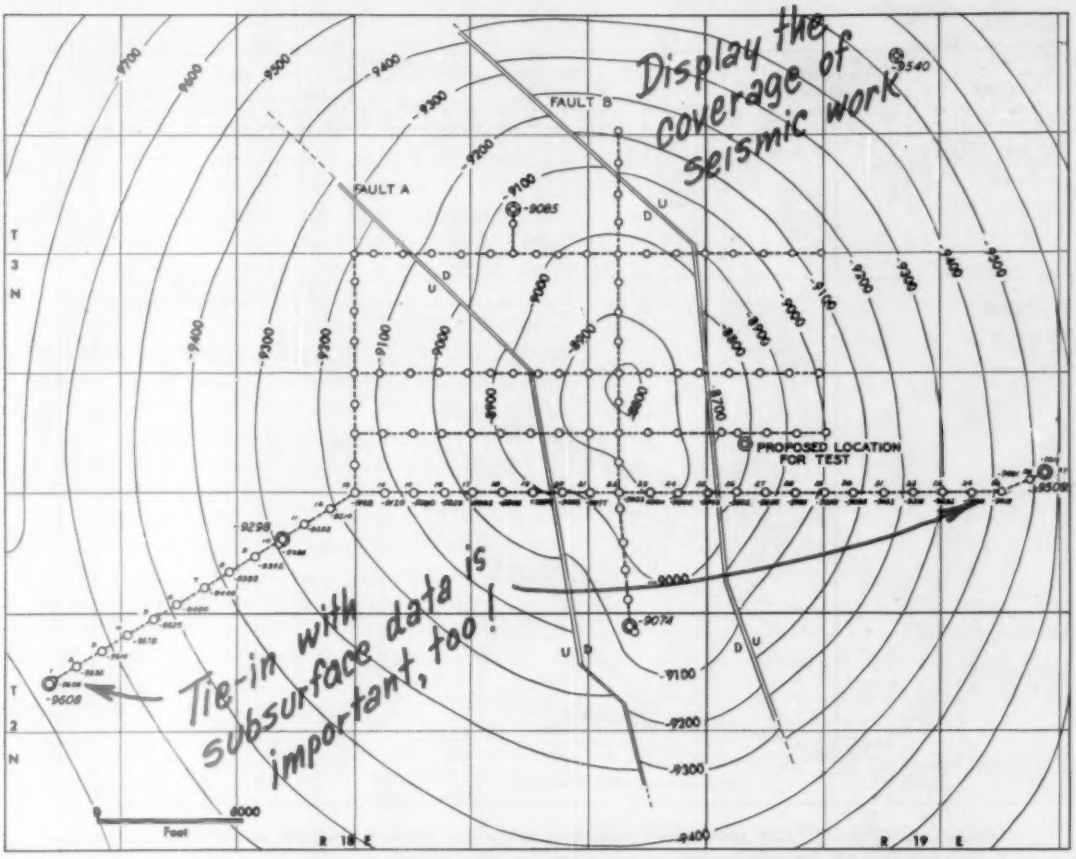
A natural tendency is to make this map too detailed. It should be clean, clear, and uncluttered. An excess of detail will hamper the presentation and defeat the purpose. More data could be added to this map which would enhance it and not affect its legibility. Note that no well numbers are given nor are the ownership tracts shown. Before adding any data, ask yourself if they're necessary. Don't have a tired, overworked map.

Scale is important. Most type field maps vary from 1 in. = 2,000 ft. to 1 in. = 500 ft. The scale you use will depend upon how much you want to tell.

Statistical components. These are an integral part of the presentation. Apart from the graphic work on the montage are three essential tabular elements. One is shown above in the upper right. These are the land and drilling data. Also included should be statistics on type field and geophysical data. They are presented separately, in boxes, and include facts and costs.

The producing-field statistical component includes: field name, discovery well, total number of wells, proximity of field to prospect, gas-oil and oil-water contact levels (original), core data, and cumulative production.

The discussion of the discovery well cites operator, fee name, location, elevation, total depth, intervals tested and perforated, initial production, gravity of oil, amount and sizes of casing, choke size, and any stimulation techniques used (fracturing, acidizing, etc.).



GEOPHYSICAL MAP shows extent and control of shooting pattern. Only seismic values on key line are included. Title box is optional; margins can supply that information.

A geophysical map is a necessary component. The key line of section and the entire pattern of shooting program is indicated. This shows whether the area under investigation has adequate control and coverage. Only the line of section has shotpoint values on it to maintain clarity.

Subsurface data obtained from all wells are included. Subsurface-seismic ties are apparent, indicating correlation to a known geologic marker. The most favorable spot for the proposed test is highlighted.

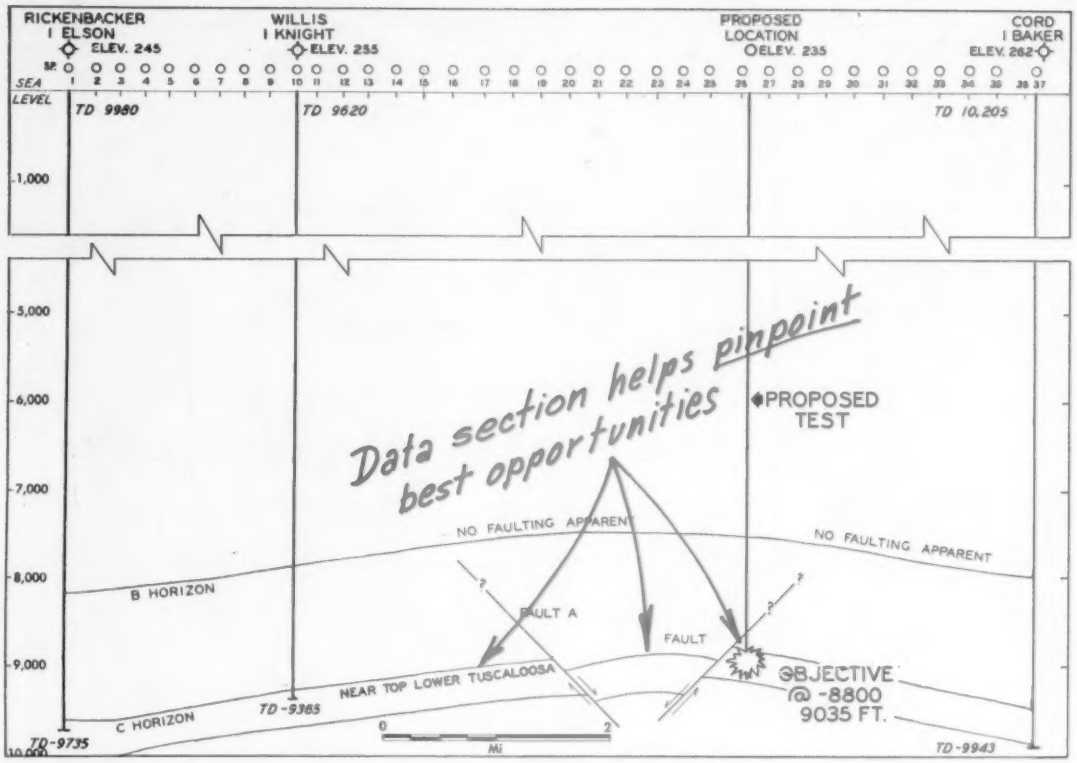
Standard scales for the seismic map vary from 1 in. = 2,000 ft. to 1 in. = 4,000 ft. Any suitable scale may be used to tell what you consider important. In the illustration above, the map is contoured on seismic Horizon C, near the top of lower Tuscaloosa. Interval is 100 ft., and the well ties are good. If a good reflector is not present near a desired geologic marker, label it as such.

The line of section, or key line chosen for the cross-section presentation, should be as nearly east-west as possible so that straight-line projection can be made from the map to the cross-section below it. If an angling line is the only one practical, turn the map so that the line of section is horizontal. Care must then be taken to show a proper north line. The horizontal scale of the map as originally planned may be too compressed for good cross-section display. In this case, enlarge the scale.

Accompanying geophysical data in a statistical box should include method and type. If data are seismic, box should include spread lengths, continuous or correlation, miles of line, hole depths, mud, phones per trace, number of traces, total days required, date completed, and total cost. Any additional information, such as permit costs or special problems, can be shown.

When seismic data are presented, it may be desirable to state the reliability of the values used. Well ties should be obvious.

The seismic cross-section horizontal scale is usual-



SEISMIC CROSS-SECTION shows well data and proposed location. Subsea values on C horizon left off for clarity—see seismic map for specific points.

ly the same as that of the seismic map. This will make them the same width, enhancing layout of the montage, and allow straight-line projections. Straight-line projections are most desirable.

The vertical scale should be the one that best illustrates structural configurations. If necessary, use a large scale (1 in. = 500 ft.) in steeply dipping country, and in an area of gentle dips go to an even larger scale (1 in. = 200 ft.). This is no problem. To avoid a section that extends from ceiling to the floor, use break symbols and cut out parts of the section of least interest.

In the cross-section above, well control is shown along the key line. The spot for the proposed test is marked. No well data, or shot-point values, were put on the carried marker, seismic Horizon C. This is optional and in the case above was omitted for presentation purposes. A glance at the map will provide the value at any point.

Where fault evidence is doubtful, it is clearly marked as questionable. Care should be taken not to overextend control and present an erroneous picture.

How to save drafting time and printing costs. Normal operating-company procedure is to draft the maps at full size. If a map was drawn at a scale of 1 in. = 4,000 ft. and was three full townships square, it would require a paper size of nearly 24 in. square. To draw all the graphic presentations at full size at desired scale for each would require much space on the montage.

Why not reduce all the maps and graphic presentations to one-third size? They are easier to draw and easier to handle. Besides, it's faster. Draw pencil sketches full size and then have negative photostats made. These can be traced easily.

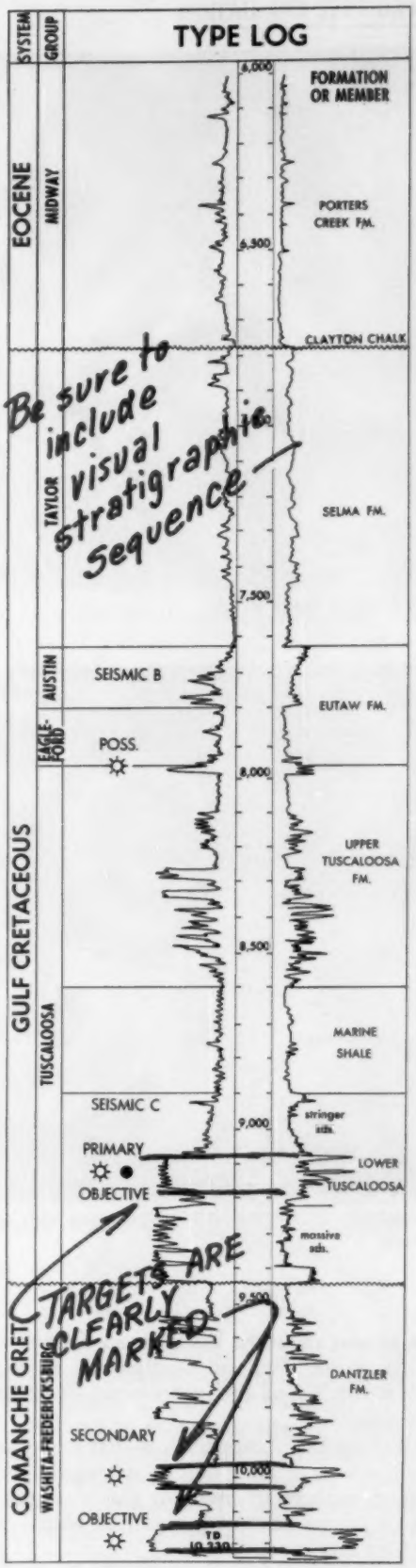
Another time saver is to do the art at reduced size and make the layout in miniature. Some operating companies have their own equipment and like to use it. With full-scale drawings, it's both costly and unwieldy. For the montage, using a full-size film negative, the film would be either 42 or 54 in. wide and approaching 6 to 7 ft. in height. Care to wrestle with that problem? Think of the cost. Why not use the latest methods with a miniature layout at one-fourth the costs? Send the work out if it cuts costs.

The type log comes next. Scale is optional. One frequently used is 1 in. = 200 ft. It should show the stratigraphy, hole depths, targets sought in the proposed test, and formation tops.

Much detail can be included in this graphic presentation. Specific lithologic symbols can be shown for all or part of the formations. All potential oil and gas zones are marked. If greater detail is desired and the log is from a specific well, information on tests and cores—porosity, permeability[6], oil and water saturations—is included. Gross thickness and net pay of producing zones can be noted in the column.

The primary objective should be conspicuously marked. Secondary targets should be highlighted. Designate whether the type log is a specific well, or a composite of several wells. Physical considerations regarding the length of the log should be studied. Which parts of the section provide the information you want to display?

Tailor the log to the layout. In a 10,000-ft. well it isnt' necessary to include the entire log. Use break symbols to make it pertinent and compact. It may be desirable to use more than one break in the stratigraphic column. Coloring the final prints improves the presentation; take advantage of it.



TYPE LOG shows the target, hole depths, and sequence of beds.

LOCATION plat tells state and sector at a glance.

DRAFTING is the first job.

LETTERING can be freehand, template, art type, or set type.

MOUNTING COMPONENTS can be done with cement or tape.

REPRODUCING MONTAGE so that prints can be made.

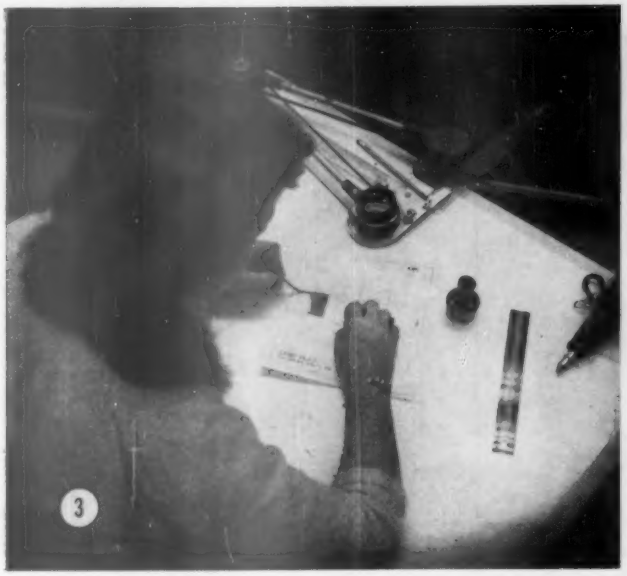
The photos show the key steps in making the actual montage. The end product will be the final print which has all the components—both graphic and statistical.

Drafting the components is first and foremost. You can save drafting time by having rough pencil sketches reduced to one-third size of chosen scale. Use of traced photostat negatives speeds up the final art and cuts costs.

Lettering can be freehand, stylus, art type, or metal type. Art type is fast and very effective. On some types of paper containing waxy finishes, the letters may slip, however.

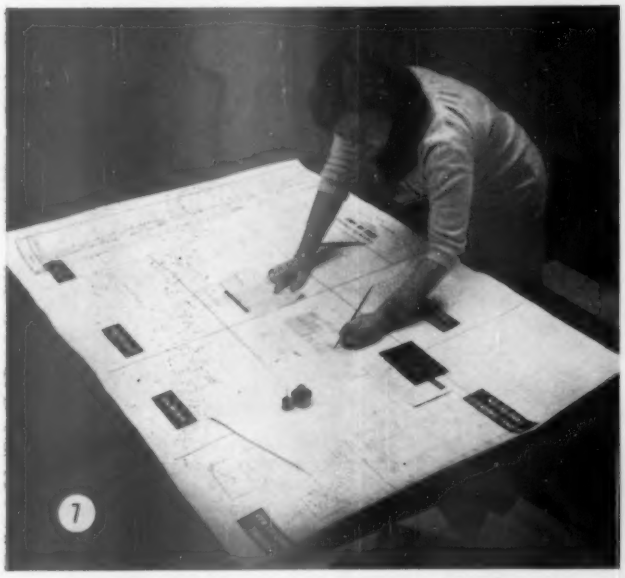
Use graphic scales before reducing the sketches.

Symmetry of the components is the critical aspect in the layout of the montage. The layout should have appeal and balance, and be arranged in a logical order.

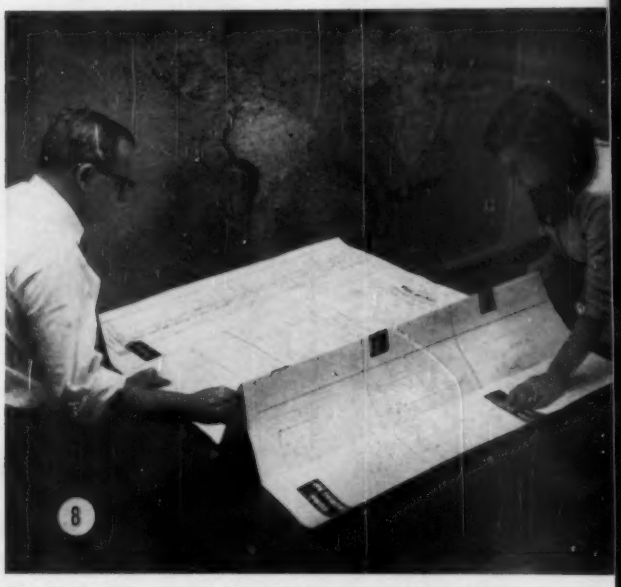


SHADING the acreage outlines company holdings.

LAYOUT OF COMPONENTS favors symmetry and logical order.



COLORING PRINTS is done with ink, water colors, or pencil. Small film is near artist's left hand.



FOLDING the prints is done with an accordion fold.

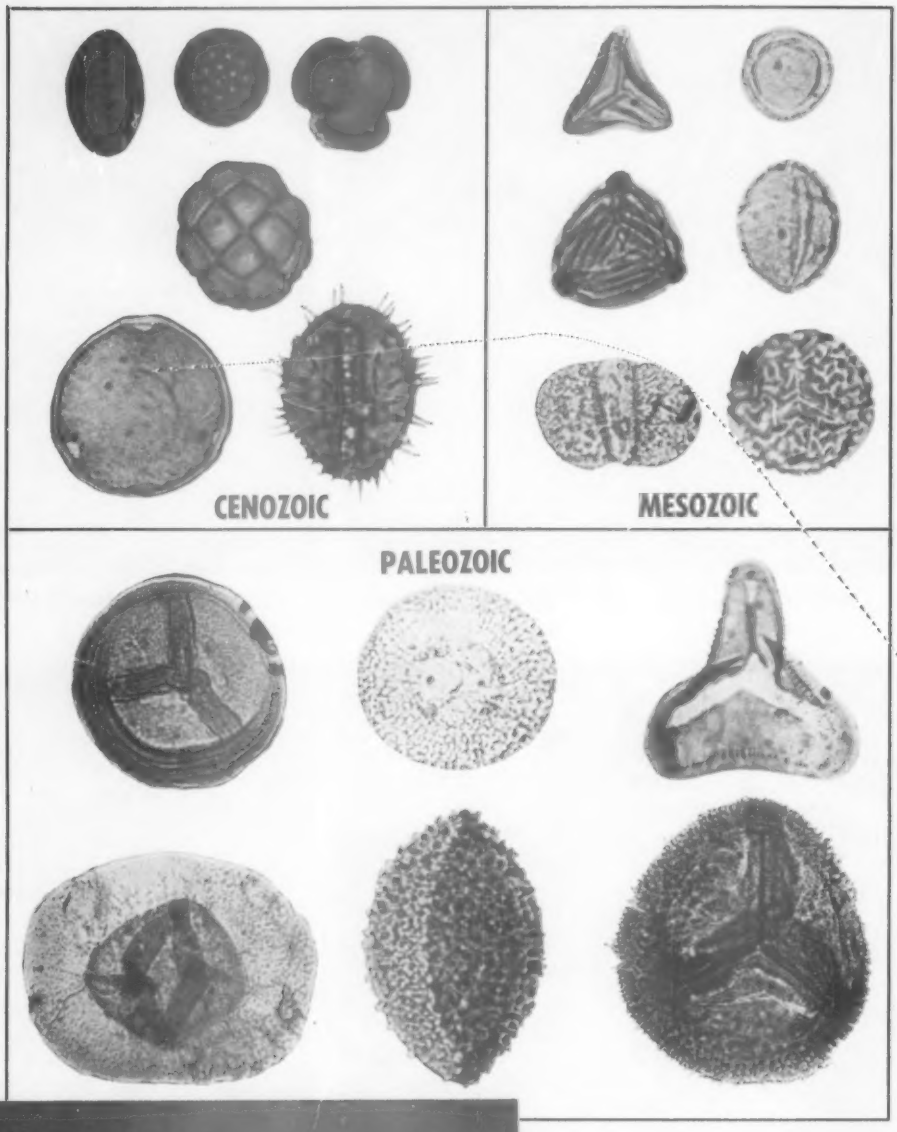
Mounting the components on a paper or cardboard backing can be done with rubber cement, masking tape, or double-adhesive pressure-sensitive tape. Cement and pressure-sensitive are preferred because they are invisible. Masking tape is used only on a full-size film negative.

The film is shot with either a vertical or horizontal camera when a miniature layout is used. The film-negative method uses rollers.

After a print of the montage is made, it is colored to highlight the most important aspects (acreage, drilling targets, geophysical highs, etc.).

The prints can be folded for files or rolled for map cabinets. For folded maps use the accordion fold so the lower right-hand corner is exposed. Size of the exposures after folding should be 8½ by 11 in. Rolled prints of the montage can be edged with edging tape to give them longer life.

Photomicrographs of Polospores, Plate 1



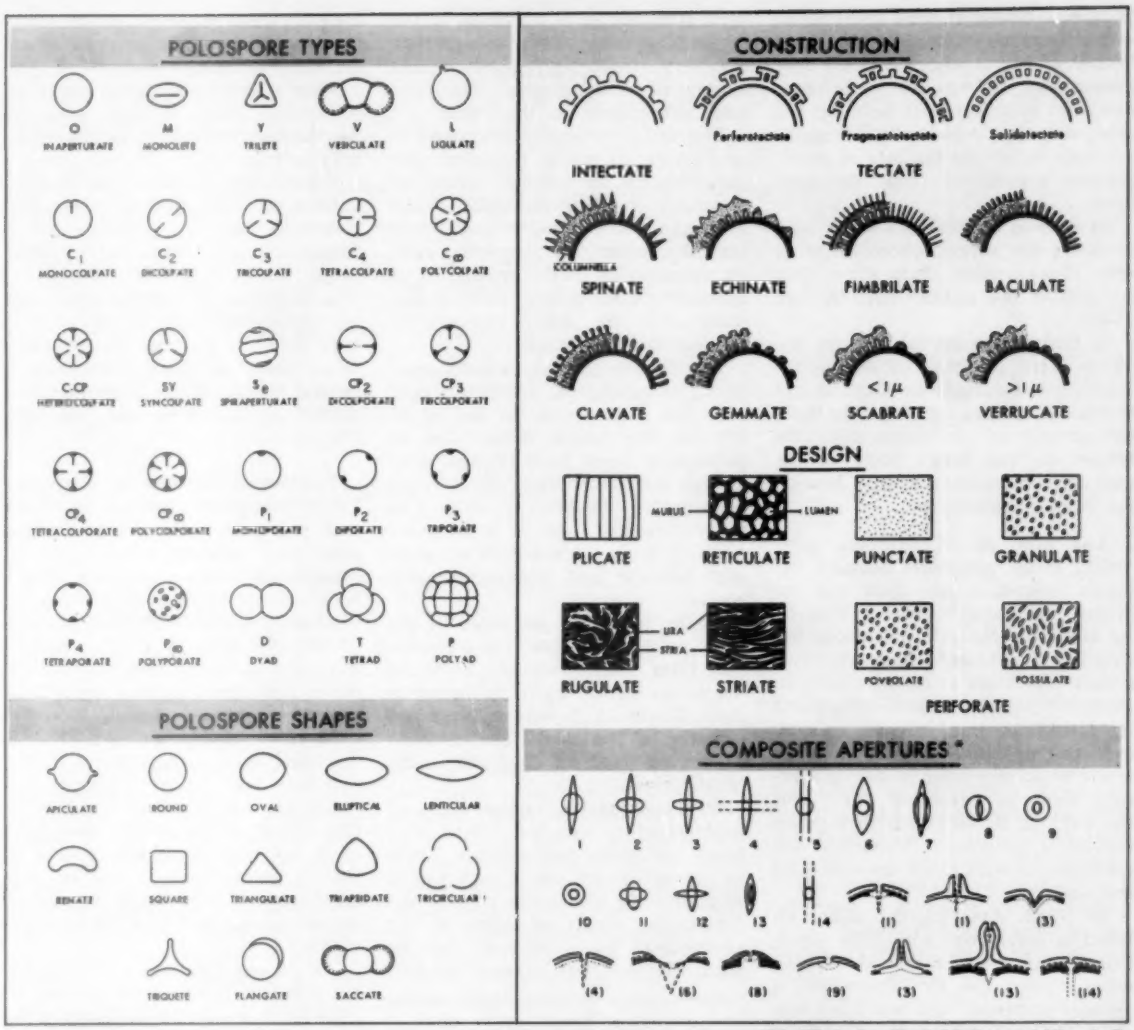
It's up to geologists to make PALYNOLOGY a working tool

BY JOHN F. GRAYSON
Senior Research Palynologist,
Socony Mobil Oil Co.,
Field Research Laboratory, Dallas

PALYNOLOGY is a relatively new science which is now being developed and used in petroleum exploration work. It is concerned with the study of polospores (pollen and spores) which are microscopic plant bodies.

Every hay-fever sufferer is intimately acquainted with polospores and their ability to produce undesirable effects. Despite this, polospores offer a valuable tool to exploration geologists.

For years, geologists have been using micropaleontology—the study of small animal fossils—to help with their correlations. Often these animal fossils have worked well. On the other hand, they are not present in some sediments, and in others they do not give the information desired.



*Modified after Kuyl, Muller, and Waterbolk.

DIAGRAMMATICAL EXPRESSIONS of some of the morphological details that concern the palynologist. At upper left are the various basic types of polospores. At lower left are some of the usual shapes, while at right are shown construction types and designs. Fig. 1.

Until recently, megascopic plant fossils have been of little or no use to exploration geologists because they are rarely recovered from well samples.

The discovery of polospores in sedimentary rocks has changed the picture. The principles of palynology indicate that this new science may provide the geologist with considerably more information, and possibly more accurate information, than has heretofore been available.

How it began. The roots of this new science go back to the early part of this century. During the late teens, several Swedish botanists and geologists were examining peat samples collected from local bogs. They were impressed by the abundance of polospores present in the peat. After learning to identify the fossil polospores with those of the plants growing in the vicinity, statistical analyses were made on the samples. Analyses from various levels in the bogs showed significant changes.

After several bogs had been examined, it was found that similar changes occurred in different bogs. These changes were interpreted as shifts in the vegetational pattern of the areas caused by a changing climate. Thus, the groundwork for modern geologic palynology was established.

During the 1920's, this work was brought to the attention of the rest of the world. Since then, interest in this branch of palynology has mushroomed. On a world-wide basis, thousands of papers have been published on Pleistocene palynology. The first papers in North America appeared in the late 1920's, and at present there are approximately 250 published works on North American Pleistocene palynology.

Here was a method that could be used to study the vegetation, stratigraphy, climatology, and paleoecology of the postglacial period. Even though the results of this research were truly amazing, the idea of applying palynology to the study of older inorganic sediments did not come quickly.

Coal takes it up. Simultaneously, another branch of the field of geologic palynology was developing. Paleobotanists and coal petrographers had been observing and describing polospores from coal deposits since the late 1800's. However, they were observed more as curiosities than as anything significant.

The idea of using polospores as an aid in correlation of coal beds seems

to have originated in the United States with a research chemist of the U. S. Bureau of Mines who was doing coal petrography. He was able to differentiate and correlate coal beds on the basis of spores. Admittedly, his methods were crude but the idea of stratigraphic correlation was definitely there.

As so often happens in science, good ideas are not always followed up and very little activity along these lines occurred in this country until the late 1940's.

In Europe, on the other hand, the 1930's were an active period for investigation, especially in England and Germany. In these countries, the modern methods of coal palynology were refined so that today many of the coal correlations are routinely done on the basis of polospores.

And now oil. Concerning palynology in the petroleum industry, the initial interest in this field was exhibited just prior to World War II. At that time, N.V. de Bataafsche Petroleum Maatschappij contracted two botany professors to examine samples from Mexico, Malay Archipelago, and the Caribbean area, in order to evaluate the potential of palynology in terms of stratigraphic work. The results were so favorable that, after the war, the Royal Dutch-Shell group initiated a program in Venezuela and since then in Shell Laboratories around the world.

In North America, the initial interest in palynology within the petroleum industry was exhibited in 1946 when Carter Oil Co. contracted a geology professor, who was a palynologist, to examine samples and evaluate the method. In the late 1940's, Standard Oil Co. of California started a program. In the mid 1950's, Magnolia Petroleum Co., Humble Oil & Refining Co., Union Oil Co. of California, Sun Oil Co., and Imperial Oil Ltd. also initiated programs, and just recently Pan American Petroleum Corp., Sinclair Oil & Gas Co., Gulf Oil Corp., Standard Oil Co. of Texas, and Richfield Oil Corp.

In foreign operations, palynology laboratories have been established in such faraway places as Venezuela, Colombia, Bolivia, Trinidad, Nigeria, Algeria, Libya, Gabon, Sumatra, Pakistan, British Borneo, France, and others.

It can readily be seen that wide interest is being exhibited in palynology by the petroleum industry. There are many good reasons for this interest.

Why It's Important

Polospores are microscopic in size. They range from about 10 to 200 μ with probably 90% of them in the 20 to 90-μ range. Even though they are very small, an almost infinite variety of morphological characteristics are present in the exine.*

The exine is usually composed of two layers, of which the outer one may contain an infinite variety of structures—hairlike processes, spines of various sizes and shapes, club-shaped processes, etc. Depending upon the construction of the exine, various distinctive designs are formed and these also are easily recognizable through the microscope.

Fig. 1 shows diagrammatically some of the morphological details that concern the palynologist. In the upper left are the various basic types of polospores. Some have no apertures; a single scar; three-prong scars; wings; a distinctive projection; 1, 2, 3, 4 to many furrows; 1, 2, 3, 4 to many pores; various combinations of pores and furrows; and compound polospores.

In the lower left are some of the usual polospore shapes. The construction types that commonly occur in the exines are illustrated in the upper right. The black shows one layer and the stippled the other. The common designs observed are illustrated in the middle right.

In discussing the various types of polospores, it was mentioned that many had pores and furrows. These in themselves are not always simple structures. In the lower right the construction types of some of the compound "pore - furrows" can be seen. The numbers without brackets are plan views of the compound pore-furrows; the numbers within brackets are cross-sectional views.

Plate 1 shows photomicrographs of polospores which illustrate some of the features expressed diagrammatically in Fig. 1.

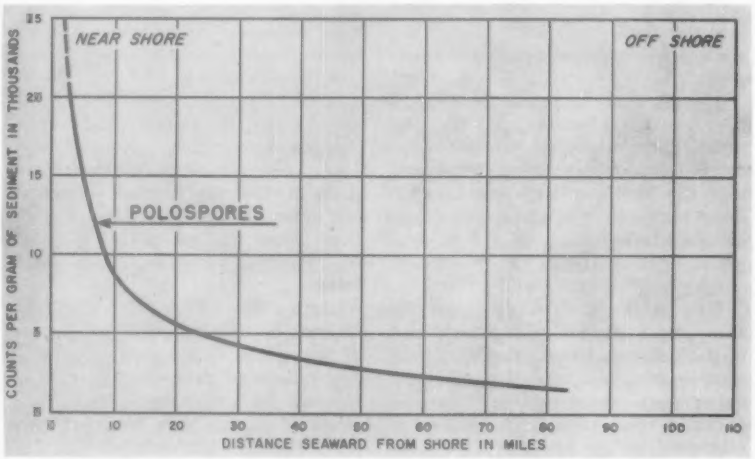
Because the morphological characteristics of polospores are genetically controlled, they are constant for a taxonomic unit. That is, different plants produce different polospores. The sediments of various ages contain polospores from the plants that were living in the area at that time. By a study of these polospores, a general picture of the vegetation that existed at that time can be constructed.

World-wide distribution. The number of polospores produced by plants each year is truly staggering. A single plant may produce billions. As an example of pollen production, it has been estimated that the forests of southern and middle Sweden produce 75,000 tons annually. This is approximately 1,000,000,000,000,000,000-000 pollen grains from a very small area of the earth's surface.

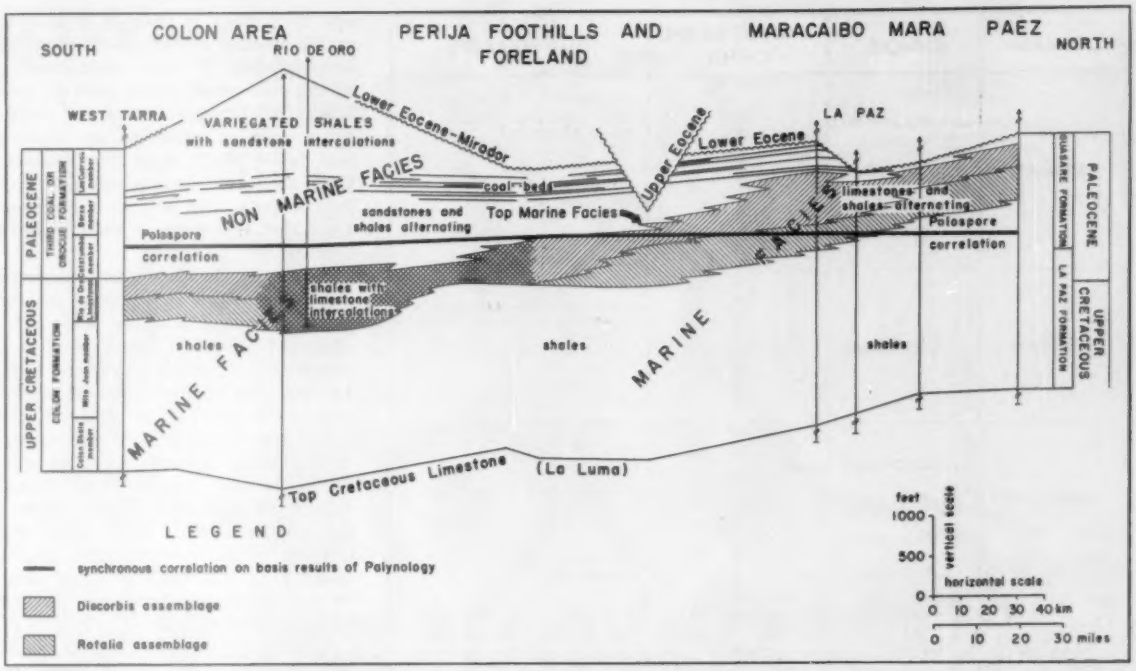
Most of the pollen produced is dispersed by the winds. From studies that have been made, it appears that polospores are dispersed over the entire surface of the earth. They have been collected thousands of feet in the air from airplanes, on ice caps hundreds of miles from vegetation, across oceans, and everywhere imaginable.

As an example, on a trip across the Atlantic Ocean from Sweden to New York, a palynologist sampled the air by means of a special vacuum-cleaner setup. Although the abundance of polospores decreased with distance from shore and increased again while approaching shore, at no

*The exine is the outer, highly resistant layer of the pollen or spore which is composed of a soft protoplasmic mass surrounded by a tough "overcoat"—the exine. The protoplasm quickly decays and this "overcoat"—the exine—is preserved and becomes the object with which palynologists are concerned.



POLOSPORE DENSITY in Recent sediments from the Gulf of Mexico. (Modified after Woods.) Fig. 2.



DIAGRAMMATIC SECTION along western rim of Maracaibo basin, showing facies relations and time stratigraphic correlation by means of polospores. (Modified after Kuyl, Muller, and Waterbolk.) **Fig. 3.**

time was any polospore-free air encountered.

While polospores are being dispersed by the winds, they are also being mixed so that when they come to rest in a depositional basin the polospore assemblage contains a representation of the surrounding vegetation. This is not meant to imply that polospore assemblages give an accurate image of the **true** picture of the regional vegetation. On the contrary, polospore assemblages do **not** always give a true picture of the regional vegetation for many reasons. For example, production of polospores varies widely among different types of plants. Various types of polospores have different dispersal capacities. Polospores from immediate vegetation may play a disproportionately large part in the assemblage. To "make sense" out of the polospore assemblages is the important function of the palynologist.

An interesting study was done along the New England coast which is composed of a series of bays, inlets, and headlands with adjacent estuaries and salt marshes. All of these present localized environments for various faunas and floras. A study was made of the faunal and floral assemblages, and they varied so much from one place to another that they could be associated only on the basis of knowing them as modern members of the Atlantic Coast biota.

However, if these floral and faunal assemblages were encountered in ancient sediments, it is doubtful that they could be determined to be synchronous. Most likely they would be considered to be of different ages, but the polospore spectra from these samples demonstrated that the sediments were correlative. This study had an interesting and practical geological application.

In the Vicksburg formation of the Oligocene, there is an offshore facies downdip. Five palynological zones were differentiated within the Vicksburg. By the application of the principles learned in the studies just mentioned, all five zones were successfully correlated through the downdip facies change.

Practical Applications

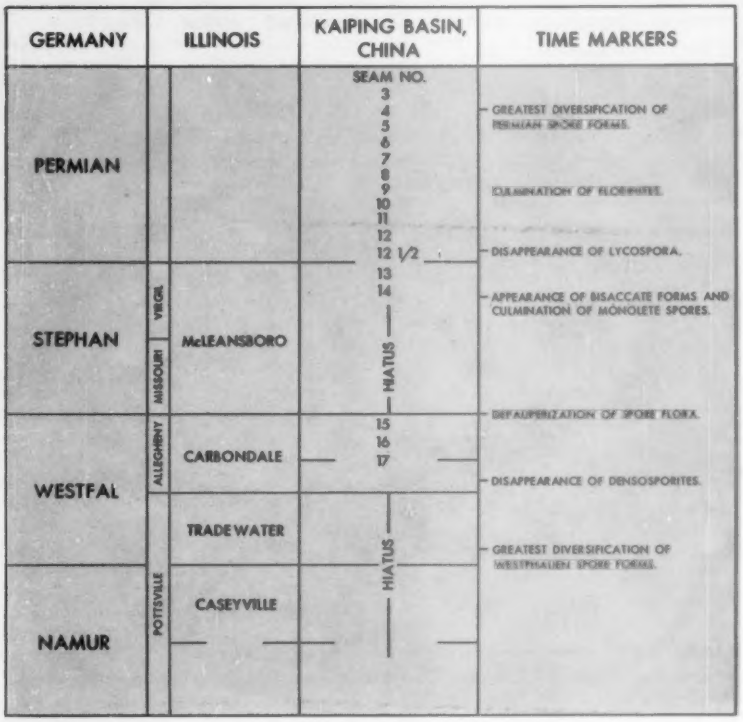
Returning to the principles of palynology, after polospores are distributed by the winds and currents, they are consolidated into the accumulating sediments. Gradually a stratified accumulation occurs. By proper sampling and processing techniques, the polospores may be recovered from the sedimentary rocks. The amount of sample necessary for processing may range from as little as 1 g. to possibly 40 or 50 g. Usually 10 g. is sufficient. The determining factor, of course, is the polospore density. In any case, the quantity of sample necessary is very small compared to that which is necessary for other geological studies.

Concerning the polospore density of samples, Fig. 2 illustrates the density as determined in recent samples from the Gulf of Mexico. As can be seen, the density decreases seaward, but even 80 miles from shore there are still approximately 2,000 polospores per gram of sediment. Considering the fact that a thousand polospores is more than sufficient for even the most detailed study, this figure is quite impressive.

In addition to density, Fig. 2 demonstrates an important potentiality of palynology as concerns petroleum geology. This is the use of palynology to determine the distance and direction of ancient shore lines. This is the idea upon which a patent was secured in the field of palynology. No attempt was made to patent palynology, as many thought, or even its use for stratigraphic correlations. The idea patented was that of using isobotanical lines to delineate ancient shore lines, and Fig. 2 illustrates that idea. Paleogeographical interpretations will probably be an important contribution from the field of palynology.

In general, polospore assemblages are independent of the aquatic basinal environment. They occur in marine, brackish, and continental sediments. This is an important principle that sets palynology apart from traditional paleontology. Practically all other fossils that have been used for stratigraphic work are products of the depositional basin and, therefore, controlled by the ecological conditions of the basinal environment.

This principle is illustrated by Fig.



CORRELATION of Upper Paleozoic strata across great distances by means of polospores. (Modified after Imgrund, 1952.) Fig. 4.

3. Notice how the correlation cuts across from a nonmarine facies to a marine facies. Notice its noncoincidence with the Discorbis rotalia foraminiferal assemblages. Here it is demonstrated that the benthonic foraminiferal assemblages were simply climbing the section from south to north.

A basic principle of the field of geologic palynology is that changes in polospore spectra have occurred throughout geologic time because of both the evolution of vegetation and the migration of vegetational units. Evolution of vegetation is indicated by the appearance of new forms, the modification of existing forms and the extinction of forms. The migration of vegetational units is caused by changes in climatic and edaphic conditions. The effects of migration cause noticeable fluctuations in the polospore profiles.

Another principle of palynology concerns stratigraphic correlations. These correlations can be made with polospores based upon the consistent general trend of polospore profiles. The reconstruction of vegetational evolution and migration by numerous profiles over a wide geographical area permits regional correlation and a dating of the principal events.

Correlation across the seas. Stratigraphic correlations based upon polospores are beginning to occur more frequently in the technical literature. Fig. 3 shows a palynological correlation extending over 200 miles along the western rim of the Maracaibo basin in Venezuela.

An idea that is rapidly emerging from this field with some evidence to support it, is that of **intercontinental correlation** by means of polospores. Fig. 4 shows a correlation of Upper Paleozoic strata from Germany to Illinois to China. The right-hand column shows the palynological events that are deemed to be correlative.

In addition to polospores, there are numerous other microscopic organisms found in sediments—hystrichosphaerids, dinoflagellates, diatoms, microforams, chitinozoans, discoasters, etc. Very little has been done with them so far but every one of these groups is potentially valuable in correlation work, knowing the geologic ranges and the ecological requirements of each group can provide valuable stratigraphic, paleoecologic, and paleogeographic data.

What's needed? In essence, most sediments contain numerous microscopic fossils that can provide the answers to geologic problems. All that is necessary to put these fossils to work for the geologist is **hard work** and **intelligent interpretation.**

Before the full potential of palynology to geology is realized, a considerable amount of basic work must be accomplished. A clear understanding of the polospores of the geologic column, their ranges, frequency variations, and relationships to modern and fossil plants must be obtained. Only then can correlations and datings be made with genuine confidence. Until then it is **more or less** intelligent speculation.

Not only is there an enormous amount of work to be done on the geologic column but the basic principles of the field must be firmly established or modified to fit the facts. In fact, one of the things so necessary right now is to discover the limitations of the field of palynology.

Palynology is handicapped at present by the lack of enough well-trained people. There are only a few universities in the country that offer any training in palynology. Most of the training in this field is being done by the petroleum companies in their research laboratories.

Concerning the genuine potentiality that palynology has to offer geology, it can be as valuable to stratigraphic geology as geophysics has been to structural geology. Its future lies in the hands of the petroleum companies.

Most exploration geologists seem to believe that the undiscovered large petroleum deposits lie in stratigraphic traps which are difficult to locate with conventional methods. The search for stratigraphic traps must be done by the geologist doing stratigraphy on a much finer scale than has been necessary until now. It is going to be necessary to have accurate time lines—**not facies boundaries that are equated to time lines.**

Palynology is a technique that may enable the geologist to do **microstratigraphy.** The two most important things that the field needs is time to develop, and competent people.

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Choppers cut Iran's mountains down to size . . . and geodetic survey time down to new lows

BY H. T. ANDERSON
Assistant head, Geological and Exploration,
and
H. SOMMER
Chief Surveyor,
Iranian Oil Exploration & Producing Co., Teheran

THE LANDWARD BOUNDARY of the agreement area of the operating companies in Iran runs some 1,800 km. through the rugged terrain of the Zagros Mountains. Completing a geodetic traverse of this boundary in 5 months is an experience that is probably unique in topographic surveying.

Perhaps a note of how this survey came to be may be of interest.

In 1954, when the oil agreement was signed, the boundaries of the agreement seemed adequately defined. The seaward boundary was defined as 3 English statute miles in the Persian Gulf from the lowest tide line. The landward boundary, except for that limited portion which is the international Iran-Iraq frontier, was defined as a line connecting a series of 19 points defined in terms of latitude and longitude. These points had not been determined on the ground. The 1,800 km. of this boundary lay largely in the mountains.

Identification of this boundary on the ground became part of the planning of the operating companies and National Iranian Oil Co. in 1957.

This boundary, through the Zagros Mountains, presented rather special problems of operations and logistics but a straightforward problem of survey. Identification on the ground and the creation of accurate topographic maps upon which the boundary could be represented were the tasks that must be done.

To accomplish this within the time schedule of this project, it was necessary to fly three strips of air photography along each sector of the boundary to be mapped. The survey on the ground must then establish a system of accurately surveyed ground control points identified on the photographs in the vicinity of the boundary. Hunting Aerosurveys, Ltd., of London, was engaged to fly this photography and for supply of the geodetic survey team making ground survey.

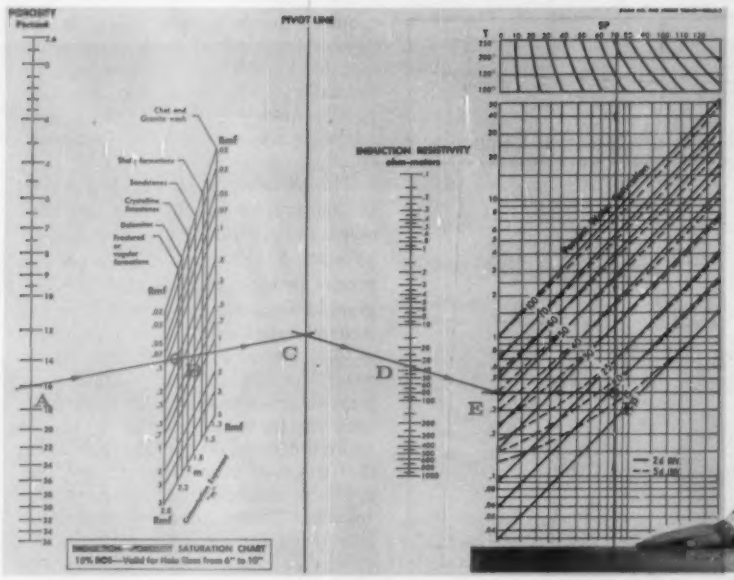
The Approach

To establish the system of ground control points, the several possible methods of survey, astrofix, triangulation, etc. were considered in terms of time required and long-range utility of data beyond the immediate use of the boundary identification.

The method best adapted to the terrain problem and to the time schedule was a geodetic traverse with precise theodolite and tellurometer. This traverse of the boundary line could concentrate the effort of the observations in the vicinity of the boundary where required. It would also be accurately tied to two triangulation chains which cross the boundary line and connect our coastal triangulation chain to the major existing triangulation chain crossing Iran from Pakistan to Turkey.

In the course of this traverse, numerous points already surveyed in the normal course of the topographic surveying for exploration support could be tied in in the central area and in the far southeast in the vicinity of Bandar Abbas and Minab. The traverse could be carried forward by helicopter support for placing the surveyors on station. Topographic maps at the scale of 1 : 50,000 could then be prepared over the entire course of the boundary.

Prior to 1955, undertaking a geodetic traverse of 2,750 km. through such rugged terrain and through which the only existing roads ran at right angle rather than along or parallel to



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The diagram at lower right shows how simple these choices are, regardless of bore hole characteristics.

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The "pigtail" chart above, taken from an Induction Log, illustrates the steps necessary to calculate FLUID SATURATION. In this example, Radiation-Induction Logs gave the following values: porosity (read directly off the Neutron Porosity Scale)—16 percent; Induction resistivity value—32 Ohms; SP value—70 millivolts.

A. Pinpoint the porosity value on the Porosity Percent Scale.

B. Pinpoint the intersection of the Rmf value of .2 Ohms (taken from the log heading) with the formation-type line in the Formation Grid Chart. (Type of formation will be known by the engineer or geologist on the well.)

C. Connect points "A" and "B" with a straight line and extend it to intersect the Pivot Line at point "C".

D. Pinpoint the Induction value on the Induction Resistivity Scale and connect it to point "C" with a straight line extended to intersect the Water Saturation Chart at point "E". Draw a horizontal line from point "E" across the chart.

E. Pinpoint the Rmf/Rw value (if known from Rw data in the area) on the Rmf/Rw Scale at the bottom of the chart and raise a vertical line to intersect the horizontal line at point "F". (If the Rw data is not available, an alternate method is to pinpoint the SP value (70 millivolts) on the SP Scale at the top and drop a vertical line.

F. Read the percent of FLUID SATURATION at the intersection of the two lines. The answer in this illustration is 19 percent.

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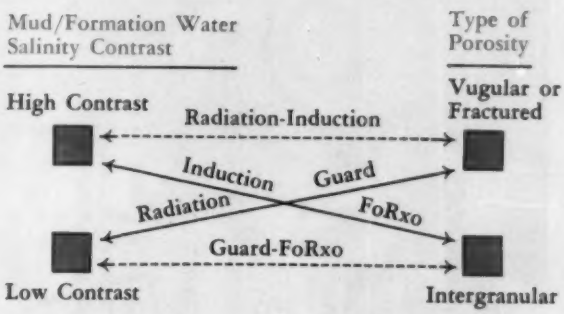

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THE LANDWARD BOUNDARY of the agreement area stretched 1,800 km. through Iran's mountains.

the course of the traverse, would have seemed fantastic within the time schedule set. The tellurometer, an electronic instrument for precise measurement of distance, has greatly increased the range of observation. Observations up to 65 km. were made in this survey. The average side observed, however, was 34 km.

To position the surveyors on station, helicopters would be the only feasible transport. Roads were nearly nonexistent in the area of interest. The few roads within the Zagros Mountains were constructed principally to cross the ranges. By road and mountain track it would be possible to touch upon the vicinity of the boundary at several points in the traverse, but only by circuitous routes out of the ranges to the central plateau of Iran, thence back into the Zagros ranges. Rather detailed planning of logistics of fuel and materials supply was indicated as well as location of base camps for the survey.

The chief surveyor, H. Sommer, assisted by Topographic Surveyor A. J. A. van der Zon, planned in detail the technical operation and the required support right down to the day-by-day work of the survey. Seven months in advance of commencing the survey every detail had been prepared. Fuel requirements had been specified for each distribution point, etc.

The planning started with a layout of the project on the best available maps, the Air Force Approach Charts at scale 1 : 250,000. Although not precise in location and detail of topographic features, these charts served well to indicate the terrain problems of the proposed traverse. All known roads were plotted and extensions of jeepable track were indicated. Possible sites for base camps were picked at approximately 100-km. intervals along the traverse course at places that could be reached by four-wheel-drive vehicles. Travel time between these sites often ran to 3 days.

Van der Zon, nominated as leader for this operation, and A. Barmakee, as camp manager, made a road reconnaissance in May 1958. They ran each road and visited each camp site. In the course of the reconnaissance, various proposed routes proved not traversable by Landrover and truck, and alternate camp sites were picked. Of fifteen camp sites chosen, 13 were actually used during the survey.

To provide the required accommodation and to hold travel time of the technical team to a minimum, the base camps were serviced by two camp parties. As the survey worked out from base camp "A," the second camp party was traveling to and establishing a camp at "B." As the survey progressed nearer to base camp "B," the survey team moved by heli-

SURVEY PROJECT LEADER at his desk kept radio contact with his surveyors.

A COMFORTABLE BASE CAMP helped ease the arduous pace of the record-breaking traverse.

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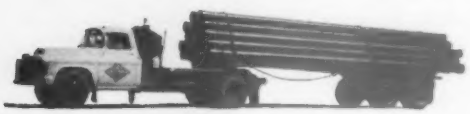

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copter to camp "B" while the camp party broke camp and traveled to camp "C" farther along the course of the traverse. Thus no time of the survey team was wasted on long and fatiguing road journey. Each camp party was outfitted with sufficient four-wheel-drive vehicles to make it quite mobile.

A detailed schedule of required geodetic observation was drawn for the survey. A series of stations spaced between 25 and 50 km. would be selected as intervisible points along the course of the traverse. The distance between stations would be precisely measured with tellurometers, and the direction angles precisely read with theodolite. About each station on the line of traverse approximately eight photopoints would be identified and the distance and angle measured.

As two triangulation chains were crossed, a precise tie-in to the traverse would be made at each. The detailed schedule indicated 130 to 135 days' observation. If no days were lost for any reason, the survey might be concluded by mid-October. Since snow would not ordinarily come to the high ridges of the Zagros before mid-November, adequate tolerance seemed to be present in the schedule to provide for minor misadventure and unfavorable weather.

Two helicopters in service at all times would be required. For safety considerations the operation was closed down if fewer than two craft were available at any time. To support continuous operation of two craft on any survey, at least three craft must be available.

Three Bell 47-J craft were in Iran with Aerocontractors doing other work for the operating companies. The working-altitude range for these aircraft unfortunately was too low to reach all points of traverse along the boundary. A fourth craft was requested with higher altitude range. The contractor supplied an Alouette which came into service August 13. The traverse had to be designed to omit a section of the highest mountains in July to return at the close of the project to survey this in October when the Alouette was available. Bells were operated satisfactorily up to 10,000 ft. With the Alouette, surveyors and instruments were readily positioned on stations up to 12,500 ft.

The thorough cooperation and understanding of objectives on the part of the helicopter pilots was an essential ingredient of the success of this project.

The Fulfillment

The geodetic traverse commenced June 14, 1959. The traverse was

closed October 31. The survey of several high-elevation photo ground control points and an additional astronomical azimuth occupied the team until November 8. During this period of slightly under 5 months a geodetic traverse of approximately 2,750-km. linear extent had been covered. Traverse stations ranged from a few feet above sea level to approximately 12,500 ft. The mean altitude of traverse stations was 7,000 ft. The mean altitude of base camps was 4,000 ft. The temperature range, daily maximums, for the base camps was 90° to 104° F.

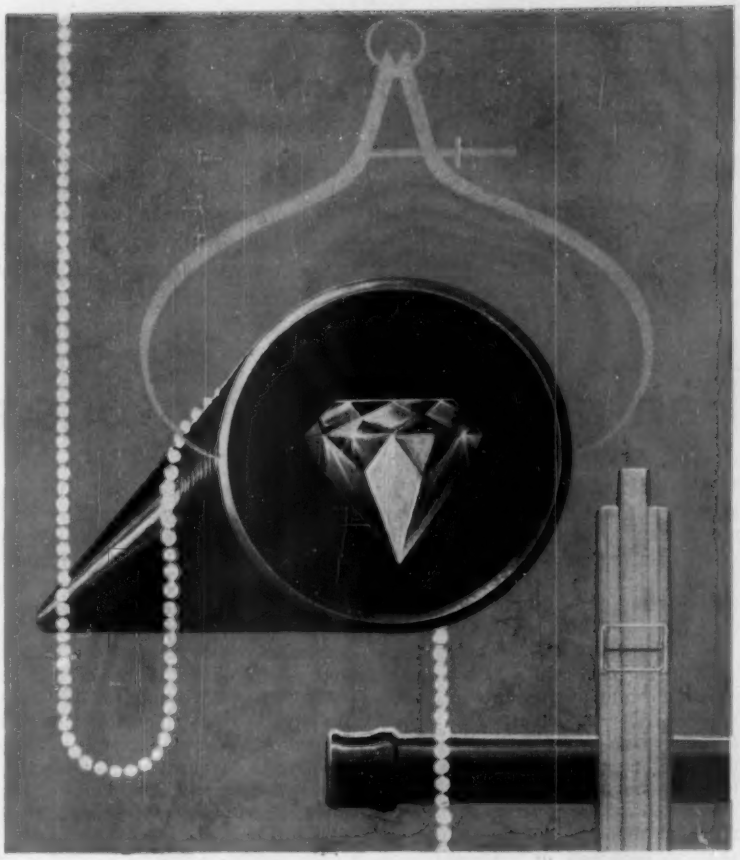
Tellurometer distance observations between traverse stations were doubly observed for check control. The average length of a traverse side was 34 km. The maximum length observed on traverse side was 65 km. The minimum was 9 km. The total length of traverse sides measured, including tie-in to two triangulation chains, was 2,737 km. In addition to traverse stations, 350 photo control points were identified, direction angles from traverse stations measured by theodolite, and distance measured by tellurometer. Astronomical azimuths were observed at eight stations in the course of the traverse.

Three Bell 47-J helicopters were used throughout the survey for a total of 875 flying hours. The Alouette was used for 275 flying hours.

Only once in the entire survey was the helicopter unable to return on schedule to a station to lift out the surveyors. On October 22, the Alouette had placed two men on a station at 12,200 ft. on Kuhe Mehboroon. In the afternoon, before returning to that station, the Alouette damaged a rotor tip while taking off from refueling. It was then unable to fly.

The station at 12,200 ft. was beyond the range of the Bell 47 J, so the two surveyors were forced to spend the night on the high ridge top. The following morning the senior surveyor on the party was able to fly in by Bell 47-J to a point at 7,000 ft. on the same mountain. With a local guide, warm clothing, and emergency rations, they climbed to the stranded surveyors and brought them down to the lower elevation, from which the Bell was later able to lift them away.

The tellurometer as well as the helicopter has proved its worth to the exploration people of the operating companies. This instrument has revolutionized the procedures of geodetic survey. In no sense has it replaced the theodolite but, for the first time, there exists an economical method of measuring distance with high precision. Measured sides will henceforth be frequent in triangulation nets.



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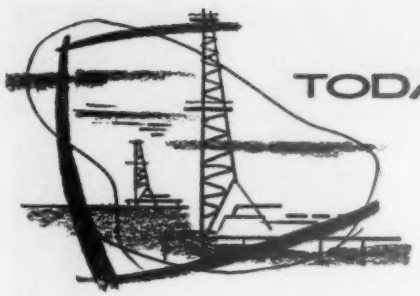


TODAY'S ACTIVE OIL FRONTS

Here is a working review of the world's most active and successful oil-hunting grounds. Some of the areas presented here are newcomers to the oil scene. Others are ripe with age but new in importance. This coverage scans a vast oil and gas arena . . . from Paris to Mackenzieland.

Panhandle-Hugoton busiest U. S. area

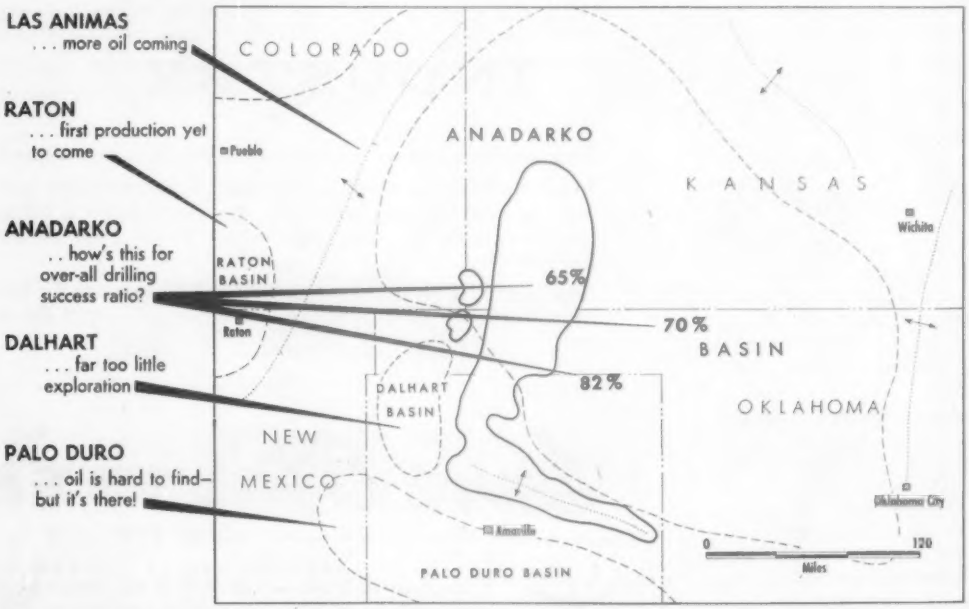
THE BUSIEST oil and gas-hunting ground in the United States today is the five-state Hugoton-Panhandle region. This vast area covers the Oklahoma and Texas panhandles, southwestern Kansas, southeastern Colorado, and northeastern New Mexico. This spring there are 275 active locations in the area with 232 companies working throughout the province. This bustling oil arena boasts the highest success ratios in the country. Success ratios range from as high as 88% in Harper County, Oklahoma, to 38.7% for the entire area. Some counties in the area reported 100% success last year in field-well development drilling.

The plays. Oil and gas production began in this area back in the 1920's, but the big push didn't begin until 1949 when Lips field gave the area its first deep production. Older drilling in the Panhandle country had been to the shallow Permian gas zones. Now exploration is two-pronged . . . deep and shallower - than - Hugoton. Biggest pay in the region is the Pennsylvanian section, one of the thickest and most prolific regional oil and gas reservoirs in the nation today. Recent drilling in the five-state area has tapped Mississippian, Ordovician, Cambro-Ordovician, and the very shallow Red Cave and Tubb sands of Permian age. But Pennsylvanian exploration still hogs the show.

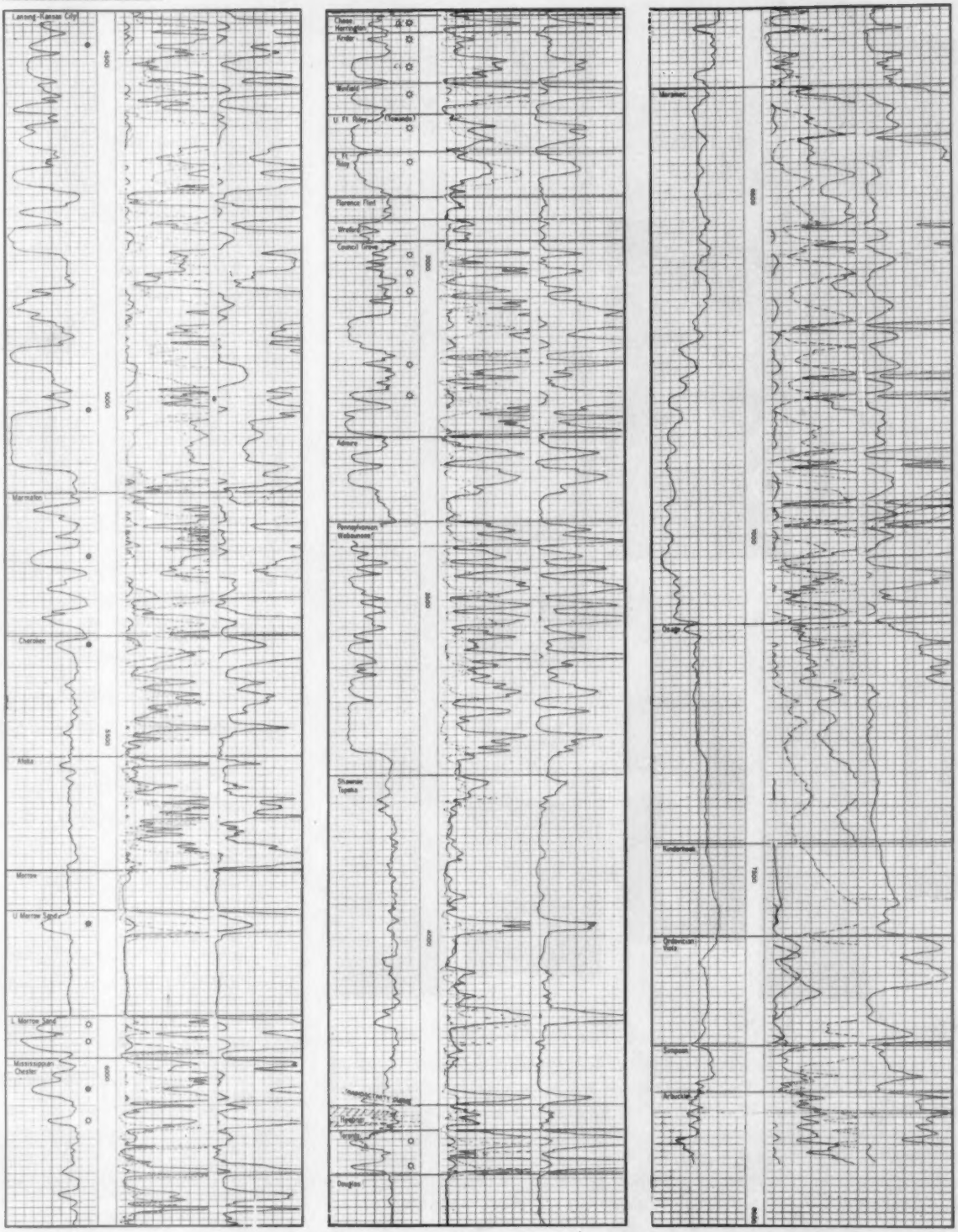
Panhandle - Hugoton is characterized by fields of multisands. This multipay era is just really beginning and should command the regional exploratory outlook for years to come. Some fields such as North Buffalo in Harper County, Oklahoma, have seven pay zones, ranging through rocks of several ages. There will be more of these in coming years.

This is currently the most attractive oil and gas province in the country. Intermediate and shallow-depth drilling, sprinkled with some 10,000-12,-000-ft. tests; an accelerated drilling program in all states concerned; high success ratios, and comparatively low drilling costs will keep this province ahead for a long time. There are of course some shadows in the glowing scene. This province of many stratigraphic trap reservoirs is a hard one to evaluate from the reserve and production viewpoint. Varied pay-sand thicknesses from field to field and limited areal extent pose serious problems to the reservoir engineers.

Despite the tremendous amount of

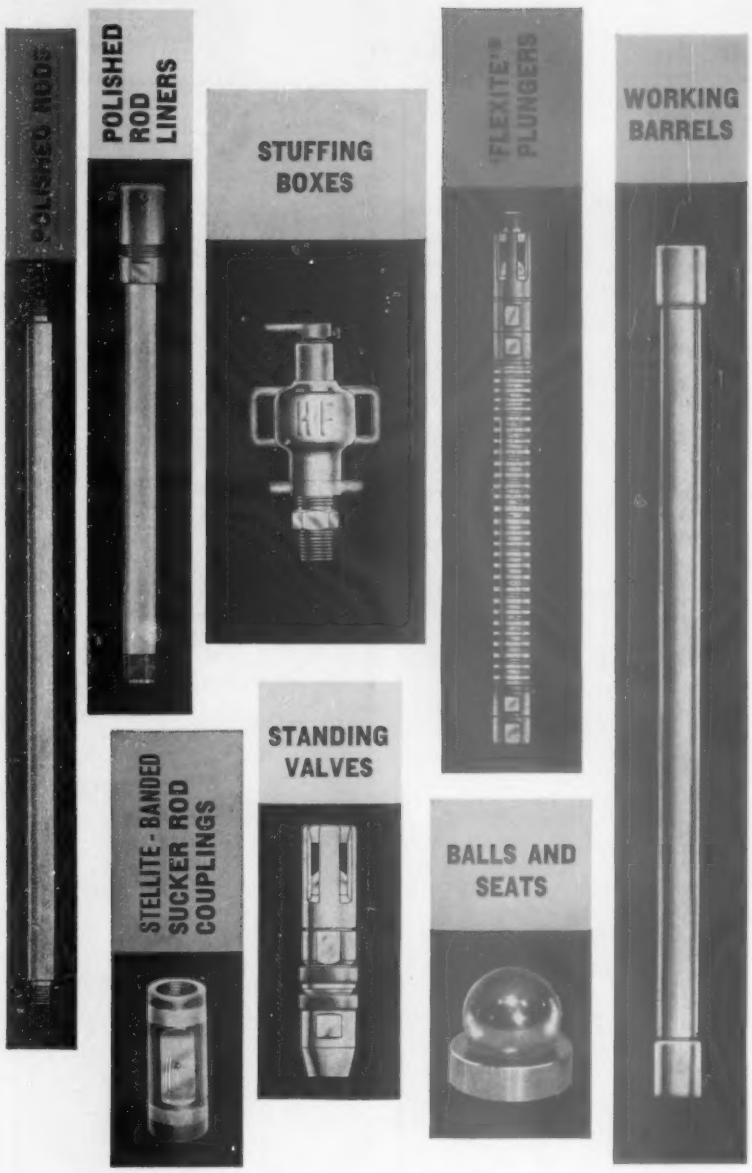


PANHANDLE-HUGOTON will enter oil's "big time" in the 1960's, taking the lead in the lower Mid-Continent.



TYPE LOG of the section of shelf facies of Hugoton-Panhandle region (Seward and Meade County, Kansas, and Beaver County, Oklahoma).

new production available to markets in the region, there is still a serious shortage of outlet facilities. This should and will be corrected in the near future. The accelerated drilling pace in the five states plus the high success ratios encounterd in both wildcatting and field-development work will overshadow the darker sides of the over-all Panhandle-Hugoton scene. Growing demand for gas, expiring lease blocks, normal competition, and real drilling enthusiasm will keep the province very much alive from now on.



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Discovery data on Panhandle-Hugoton

SOUTHWEST KANSAS

Over-all success ratio: wildcats 25%, fields 75%.

Finney County

1959: One new field.
1960: No discoveries, two field-well completions.
Success ratio: Wildcats 26%, field wells 91%.
Eight active locations.

Grant County

1959: Two new fields.
1960: No discoveries, one field-well completion.
Success ratio: Wildcats 62%, field wells (none drilled).
No active locations.

Haskell County

1959: Five new fields.
1960: No discoveries, nine field-well completions.
Success ratio: Wildcats 85%, field wells 72%.
Six active locations.

Meade County

1959: Six new fields.
1960: One new field, five field-well completions.
Success ratio: Wildcats 43%, field wells 60%.
Nine active locations.

Morton County

1959: Four new fields.
1960: One new field, six field-well completions.
Success ratio: Wildcats 83%, field wells 85%.
Seven active locations.

Seward County

1959: Three new fields.
1960: No discoveries, two field-well completions.
Success ratio: Wildcats 33⅓%, field wells 60%.
Two active locations.

Stanton County

1959: Three new fields.
1960: No new fields, one field-well completion.
Success ratio: Wildcats 42%, field wells (none drilled).
No active locations.

Stevens County

1959: Two new fields.
1960: No new discoveries, two field-well completions.
Success ratio: Wildcats 50%, field wells 71%.
No active locations.

SOUTHEAST COLORADO

Over-all success ratio: Wildcats 30%.

Bent County

1959: One new field.
Four active locations.

Kiowa County

1959: One new field.
Four active locations.

Prowers County

1959: One new field.
Two active locations.

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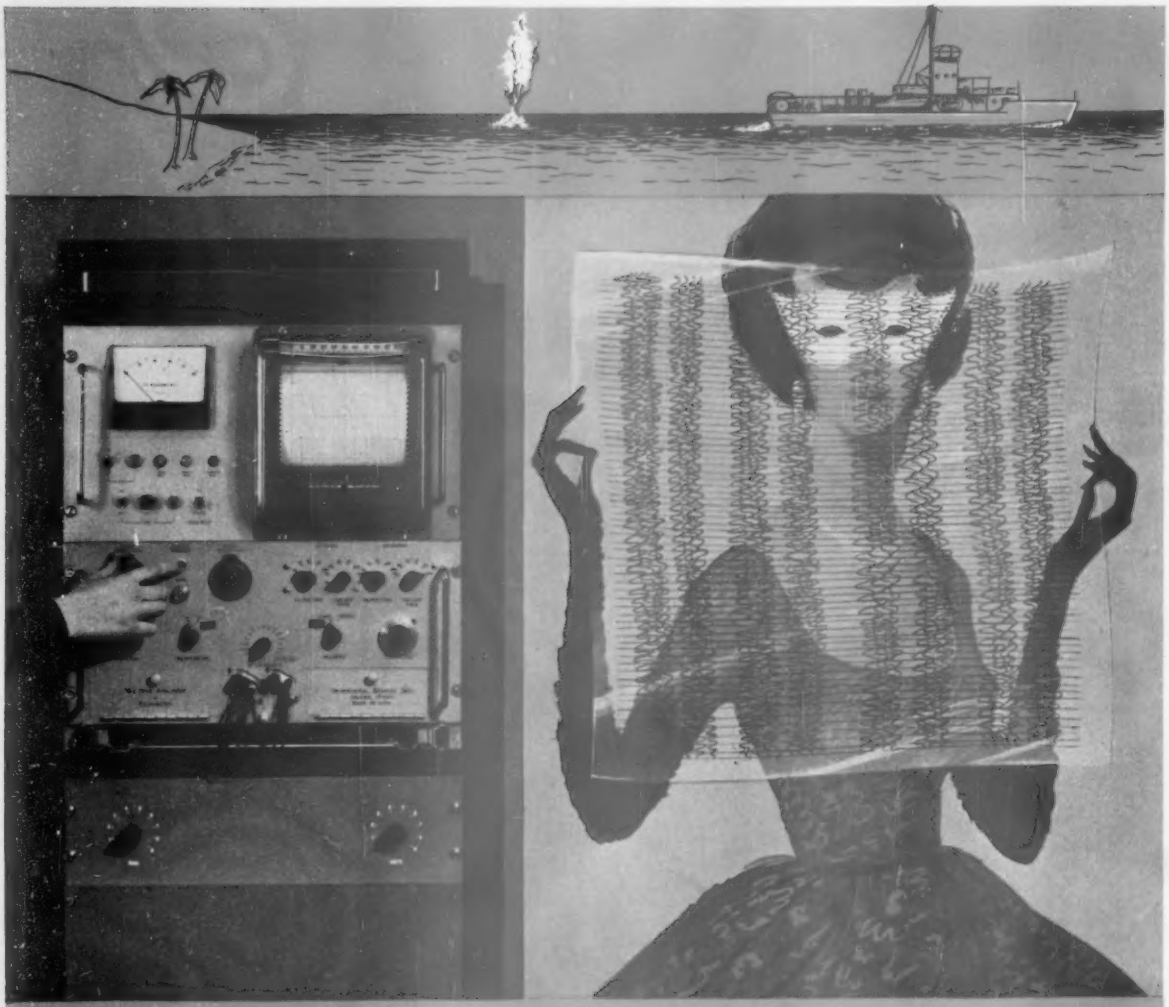

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the case of the masked reflection

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NORTHWEST OKLAHOMA

Over-all success ratio: Wildcats 54.3%, field wells 78.4%.

Beaver County
1959: Twenty-four new fields, new pays, and extensions.
1960: Five discoveries, 37 field-well completions.
Success ratio: Wildcats 69.8%, field wells 76.9%.
Fifty-four active locations.

Blaine County
1959: One new field.
1960: No discoveries, no field-well completions.
Success ratio: Wildcats 50%, field wells 100%.
Three active locations.

Cimarron County
1959: Four new fields.
1960: No new fields, four field-well completions.
Success ratio: Wildcats 27%, field wells 40%.
Two active locations.

Custer County
1959: Two new fields.
1960: No discoveries, one field-well completion.
Success ratio: Wildcats 66⅔%, no field wells drilled.
Two active locations.

Dewey County
1959: Four new discoveries.
1960: No discoveries, no field-well completions.
Success ratio: Wildcats 50%, field wells 100%.
Ten active locations.

Ellis County
1959: Seven new fields.
1960: One new field, three field-well completions.
Success ratio: Wildcats 40%, field wells 85.7%.
Nine active locations.

Harper County
1959: Six new fields, seven new pays and extensions.
1960: Two discoveries, 13 field-well completions.
Success ratio: Wildcats 34.8%, field wells 88%.
Twenty-five active locations.

Major County
1959: Five new fields.
1960: One new field, three field-well completions.
Success ratio: Wildcats 46%, field wells 70%.
Ten active locations.

Texas County
1959: Twenty-nine new discoveries, new pays, and extensions.
1960: Three new discoveries, 10 field-well completions.
Success ratio: Wildcats 52.3%, field wells 70.4%.
Eighteen active locations.

Woodward County
1959: Three new fields.
1960: One discovery, one field-well completion.
Success ratio: Wildcats 21%, field wells 100%.
Three active locations.

TEXAS PANHANDLE

Over-all success ratio: Wildcats 65%, field wells 88%.

Hansford County
1959: Eight new fields.
1960: No discoveries, 13 field-well completions.
Success ratio: Wildcats 40%, field wells 72%.
Twelve active locations.

Hemphill County
1959: One new field.
1960: No discoveries, no field-well completions.
Success ratio: Wildcats 17%, field wells 66⅔%.
Two active locations.

Hutchinson County
1959: One new field.
1960: No discoveries, 56 field-well completions.
Success ratio: Wildcats 10%, field wells 92%.
Nineteen active locations.

Lipscomb County
1959: Four new fields.
1960: No discoveries, four field-well completions.
Success ratio: Wildcats 20%, field wells 78%.
Eleven active locations.

Ochiltree County
1959: Twenty-one new fields.
1960: One discovery, 26 field-well completions.
Success ratio: Wildcats 62%, field wells 89%.
Thirty-two active locations.

Roberts County
1959: Three new fields.
1960: No discoveries, one field-well completion.
Success ratio: Wildcats 21%, field wells 89%.
Two active locations.

Sherman County
1959: One new field.
1960: No discoveries, four field-well completions.
Success ratio: Wildcats 50%, field wells 48%.
Four active locations.

Fields in Panhandle-Hugoton Area—1959 to Date

Oklahoma

ELLIS COUNTY

Pool or location	Pay zone	Prod. depth	Pay thickness	No. of wells
1. N.E. Arnett	Tonkawa	7,240	16	1 oil
2. N. Catesby	L. Morrow	8,150	23	2 oil
3. S. Goodwin	L. Morrow	11,000	136	2 gas
4. E. Harmon	Cottage Grove	7,990	14	2 oil
5. Luther Hill	Tonkawa	5,835	4	1 gas
6. N. Salon	Morrow	8,000	18	1 gas
7. E. Shattuck	Morrow	9,860	6	1 gas

TEXAS COUNTY

1. N.E. Burdge	St. Louis	6,850	4	1 oil
2. Carthage	Topeka	3,020	17	6 gas
3. Carthage	Morrow "G"	4,600	4	2 oil
4. S.E. Goodwell	Cherokee	6,025	13	1 oil
5. S.E. Guymon	Oswego	5,800	18	1 oil
6. N. Hitchland	Oswego	5,830	14	1 gas
7. N.W. Hitchland	Council Grove	3,150	21	1 gas
8. N.W. Hitchland	Morrow "G"	6,850	31	1 gas
9. N.W. Hough	Morrow "A"	6,170	20	5 oil
10. N.W. Hough	Mororw "G"	6,540	8	3 oil
11. N.W. Hough	Keyes	6,570	10	1 gas
12. S. Hovey	Cherokee	5,480	13	13 oil
13. S. Hovey	Morrow "A"	6,100	10	1 oil
14. N.W. Ona	Purdy	4,445	8	1 gas
15. E. Postle	Cherokee	5,650	16	1 gas
16. E. Postle	Morrow "B"	6,330	13	1 gas
17. E. Postle	Morrow "A"	6,140	10	1 oil
18. E. Postle	Morrow "G"	6,450	7	3 oil
19. S.E. Postle	Morrow "A"	6,120	12	1 oil
20. S.E. Postle	Morrow "B"	6,360	20	1 gas
21. 4-1n-17eCM	Chester	6,907	19	1 gas
22. 11-3n-16eCM	Morrow	6,598	32	1 gas
23. 8-3n-17eCM	Morrow	6,360	27	1 gas
24. 11-4n-14eCM	Morrow	6,160	10	1 gas
25. 20-4n-16eCM	Keyes	6,555	63	1 gas
26. 24-4n-16eCM	Keyes	6,493	7	1 gas
27. 5-5n-18eCM	Chester	6,482	30	1 gas
28. 28-5n-18eCM	Chester	6,528	25	1 gas
29. 18-6n-10eCM	Purdy	4,300	14	1 gas

BEAVER COUNTY

1. S. Balko	U. Morrow	7,390	19	1 gas
2. S. Boyd	U. Morrow	6,950	21	4 oil
3. S. Boyd	L. Morrow	7,050	16	4 gas
4. S. Boyd	Miss.	7,350	39	1 gas
5. W. Clear Lake	Morrow	7,740	12	2 oil
6. N.E. Como	M. Morrow	7,575	7	2 gas
7. S. Como	U. Tonkawa	5,550	29	1 gas
8. S. Como	L. Tonkawa	5,950	16	7 gas
9. N.W. Dower	Chester	7,830	40	2 gas
10. W. Elmwood	Morrow	7,410	19	1 gas
11. S.E. Floris	Morrow	6,325	6	1 gas
12. N.E. Forgan	Marmaton	5,490	5	1 oil
13. N. Grand Valley	Keyes	6,730	10	1 gas
14. E. Holland	L. Morrow	7,990	10	1 gas
15. N.E. Ivanhoe	Cherokee	7,300	46	1 gas
16. N.E. Ivanhoe	Morrow	8,210	18	1 gas
17. N.W. Knowles	Cherokee	5,800	12	1 oil
18. 6-Mile	Oswego	5,920	10	1 oil
19. 6-Mile S.	Oswego	6,325	37	1 oil
20. 9-1n-24eCM	Morrow	8,032	15	1 dual gas
		8,562	6	.....
21. 26-2n-21eCM	Morrow	7,623	79	1 gas
22. 9-4n-21eCM	Chester	6,508	96	1 gas

Pool or location	Pay zone	Prod. depth	Pay thickness	No. of wells
23. 9-5n-28eCM	Morrow	6,175	31	1 gas
24. 34-5n-28eCM	Miss.	6,641	129	1 gas
HARPER COUNTY				
1. S. Laverne	Morrow	7,360	35	3 oil
2. W. Stockholm	Tonkawa	5,560	9	1 oil
3. S. Woodburn	Hoover	4,329	36	1 dual oil
	Tonkawa	5,578	22	and gas
4. N. Lovedale S.	Oswego	5,572	10	1 oil
5. E. Clark Creek	Morrow	5,700	10	1 gas
	Elgin	4,366	...	1 gas
6. Clark Creek	Morrow	5,798	8	1 (Okla.) 2 (Kans.)
(7 new pays and extensions in county)				
WOODWARD COUNTY				
1. W. Chester	Chester	7,952	28	2 gas
2. Edith	Chester	5,896	72	1 gas
3. S.E. Lovedale	Morrow	6,388	21	1 gas
CUSTER COUNTY				
1. S.E. Custer City	Springer	13,365 & 13,410	28	1 gas
2. N. Custer City	Hunton	14,773 & 14,383	134	2 gas
DEWEY COUNTY				
1. Putnam	Morrow	11,211 & 11,232	20	3 gas
2. N. Oakwood	Morrow	9,490	70	1 gas
3. Taloga	Morrow	10,185	23	1 oil
4. Lenora	Morrow	10,302	30	1 gas
	Chester	10,358	24	1 gas
BLAINE COUNTY				
1. Squaw Creek	Cherokee	10,764	42	3 gas
	Morrow	11,665	191	1 gas
MAJOR COUNTY				
1. W. Campbell	Hunton	8,271	93	2 gas
2. N. Fairview	Cherokee	6,800	32	1 gas
3. E. Forest Home	Miss.	6,780	54	1 oil
4. Roscoe	Chester	7,110	12	1 gas
5. N.E. Seiling	Chester	8,350	19	1 gas
CIMARRON COUNTY				
1. S.W. Burton	M. Morrow	4,480	20	3 oil
2. E. Griggs	Marmaton	3,950	13	1 gas
3. W. Keyes	Des Moines	4,130	6	1 gas
4. W. Keyes	Keyes	4,830	6	1 gas

Texas

OCHILTREE COUNTY				
1. Barlow	Miss.	8,680	14	1 oil
2. Chunn	U. Morrow	7,750	5	1 oil
3. Dude Wilson	Atoka	7,910	10	1 oil
	Morrow	7,760	4	1 oil
4. Dutcher	Cleveland	7,380	14	1 oil
5. Ellis Ranch	Cleveland	6,960	20	2 gas
	Marmaton	7,170	26	1 oil
	Morrow	8,320	49	1 gas
	Miss.	9,240	45	1 gas
6. Farnsworth	L. Mo.	6,600	20	1 oil
7. E. Farnsworth	Miss.	8,930	20	1 gas
8. S.E. Farnsworth	U. Morrow	8,330	6	2 gas
9. Horizon	Oswego	7,090	5	1 oil
10. McGarraugh	Atoka	8,100	12	1 gas
	Miss.	9,130	10	
11. Northrup	Cleveland	7,090	24	3 gas
12. Pan-Petro	Novi	8,460	23	3 oil
13. P.E.I.	L. Morrow	8,200	23	1 oil
14. W. Perryton	Marmaton	7,110	8	2 oil
15. Share	Cherokee	7,000	44	1 oil
16. S.E. Share	U. Morrow	7,560	8	9 oil
17. W. Turner	L. Morrow	9,320	10	2 gas
(4 unclassified discoveries not listed)				
HUTCHINSON COUNTY				
1. Bar-9	Permo-Penn	4,905	5	1 oil
HANSFORD COUNTY				
1. Hansford	Marmaton	6,475	3	2 gas
2. N. Hansford	Cleveland	5,980	6	1 oil
3. W. Hitchland	Morrow	6,750	15	4 gas
(5 unclassified discoveries not listed)				
LIPSCOMB COUNTY				
1. Bechthold	Tonkawa	6,150	18	4 oil
2. Brodford	Cleveland	7,330	20	2 oil
	Morrow	8,990	23	1 gas
3. N. Feldman	Tonkawa	7,625	25	1 oil
4. Lipscomb	Cleveland	7,970	10	1 gas
SHERMAN COUNTY				
1. Cator	Tubb	1,940	44	1 gas
ROBERTS COUNTY				
1. S. Lips	Miss.	8,625	3	1 gas
2. W. Lips	Cleveland	6,750	16	1 gas
3. Red Deer	Penn. GW	9,000	...	1 oil
HEMPHILL COUNTY				
1. Parsell	Cherokee	9,500	16	1 oil

Kansas

MEADE COUNTY				
1. Angell	Morrow	5,650	15	1 dual
2. Barragree	Council Grove	3,100	31	1 gas
3. Borchers	Morrow	5,720	5	1 gas
4. N. Borchers	Marmaton	5,085	4	1 gas
	Morrow	5,550	33	5 gas
5. N.W. Borchers	Morrow	5,610	18	2 oil
	Morrow	5,615	8	2 gas
6. Horace, S.	Council Grove	3,230	16	1 gas
	Toronto	4,400	12	dual
STANTON COUNTY				
1. Beauchamp	Chester	5,340	6	1 oil
2. E. Beauchamp	Morrow	5,018½	1	1 gas
3. Shore	Miss.	5,330	10	1 oil
MORTON COUNTY				
1. Boehm	Morrow	4,860	28	1 oil
2. Kinsler	Toronto	4,336	6	1 gas
	Miss.	5,465	10	dual
3. Rolla	L. K.C.	4,250	10	1 gas
4. Wilburton	Topeka	3,100	53	1 gas
	Morrow	4,810	12	1 gas
HASKELL COUNTY				
1. Eubank	Lansing	4,100	18	1 gas
	Marmaton	4,660	24	1 oil
	Morrow	5,350	18	1 oil
	Morrow	5,200	24	2 gas
2. N. Eubank	Morrow	5,365	7	3 oil
3. E. Eubank	Morrow	5,340	4	1 oil
	Chester	5,500	36	1 oil
	Chester	5,360	9	1 gas
4. S.E. Eubank	Lansing	4,170	6	1 oil
5. S. Eubank	Lansing	4,080	17	1 gas
GRANT COUNTY				
1. Hick	Chester	5,470	14	1 oil
2. Pollyanna	Lansing	4,135	5	1 oil
SEWARD COUNTY				
1. Kismet	Morrow	5,635	5	1 oil
2. Shuck	Chester	6,240	5	1 oil
	Chester	6,000	9	1 gas
3. Wide Awake	Chester	6,475	7	1 oil
STEVENS COUNTY				
1. Panoma	Morrow	5,330	4	3 gas
2. Walkenmeyer	B. Morrow	6,150	21	2 gas
FINNEY COUNTY				
1. Wampler	Marmaton	4,280	12	4 oil

Colorado

PROWERS COUNTY				
1. Barrel Springs	Morrow	5,030	9	1 oil
BENT COUNTY				
1. Frankfort-McClave area	McClave	4,744	10	1 oil
KIOWA COUNTY				
1. Huber 1 Stubbs	Lansing	3,682	2	1 oil

Data source: National Petroleum Bibliography, Oil and Gas Journal.

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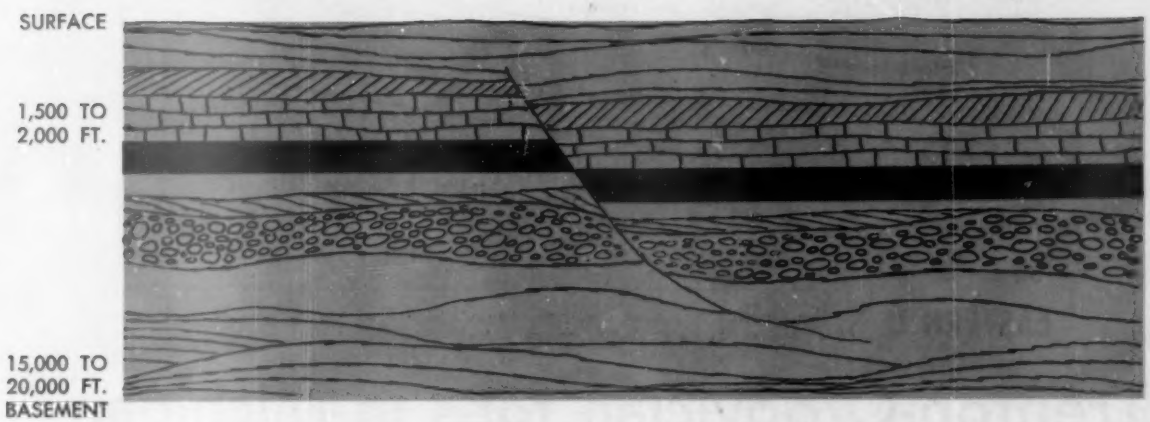

A near surface normal fault, shown graphically above, will give a gravity minimum, when the "basement" is remote

Geologists can now assess the validity of geologic assumptions near the surface and at depth, by use of the SSC Optical Analog Gravity Computer. This computer gives a graphic presentation of gravity anomaly interpretations.

The near-surface fault shown is an example of a gravity problem easily portrayed. An interpretation of a fault anomaly that does not consider that the basement is remote and has a very small effect, would suggest an entirely different type of anomaly.

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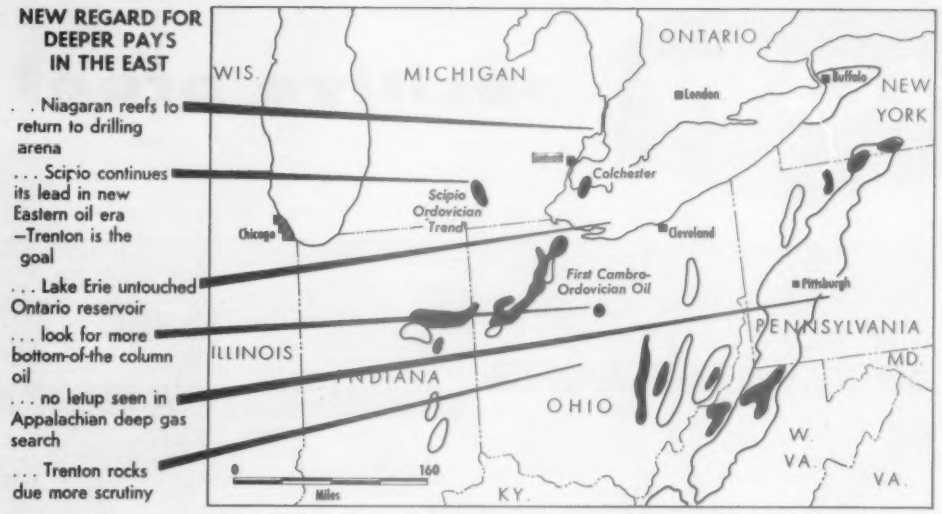

EASTERN U. S. The nation's oldest oil and gas province is one of the liveliest of U. S. producing areas as explorers attack wildcat barriers on five fronts.

Trenton-Ordovician tops in Michigan

MICHIGAN is gearing up for a big summer development campaign, concentrated in southern Michigan for 4,000 to 5,000 ft. Trenton-Black River Ordovician oil production.

The 25-mile-long trend from Adams northwest to Albion has been only partly drilled, with blank areas from 1 to 3 miles long between the four pool areas of major activity. Thirty or more rigs are expected to be active in field drilling alone once the spring breakup is over.

Play began in 1959. Discovered late in 1956 at Scipio pool in Hillsdale County, the play did not blossom into a boom until last year as Adams, Pulaski, and Albion pools were discovered on the same trend.

As of the end of the first quarter there were 131 producing oil wells in the area, including 66 in Scipio, 2 in Adams, 41 in Albion, and 22 in Pulaski. All wells are prorated at 150 bbl. of oil per day but not more than 200,000 cu. ft. of gas per day. On a field basis production has been averaging from 115 to 125 bbl. per well. A spacing pattern of 20 acres has been set.

Fracture-type pool. Producing from a fracture-type reservoir in secondary dolomite, so far the productive area is no more than 1 mile wide east-west. Cutting out of the dolomite coming up on the fracture has and probably will continue to account for a fairly high ratio of dry holes in defining a given pool. Absolute dry holes are often found on offsets to wells flow-tested at 200 bbl. of oil per hour.

The pay. The Trenton-Black River section is approximately 600 ft. thick, with gas production starting from 50 to 100 ft. below the top. Oil saturation has been logged for as much as 150 ft. but productive pay generally is expected to average from 15 to 35 ft. Ultimate recoveries under present production methods are expected to average 8,000 to 10,000 bbl. per acre. The state reported evidence of some coning of both gas and water in December.

Drilling. With a few exceptions, rotary drilling is being used throughout the play. On an average, the 4,000-ft. holes are being drilled in 20 days. The Trenton itself is the hardest drilling and may require two to four bits contrasted to 8 to 10 for the upper part of the hole.

The casing program was revised in January in an attempt to give better control in the event of loss zones or blowouts. The present practice calls for setting at least 1,000 ft. of 8 or 10-in., cemented with 450 sacks. Some operators then drill to total depth where 5-in. string is cemented with 150 sacks. A short surface string is used in some instances.

An alternative is to set 600 ft. of 10-in. and then cement a 6-in. string at 3,600 ft., with a 4½-in. liner finally cemented below the gas-oil contact.

Costs. Costs are averaging from $55,000 to $70,000 for a completed producing well. Rotary-drilling costs range at the $5 per foot mark.

In numerous instances both total costs and completion times have shot far over the average due to loss zones,

SCIPIO DRILLER'S LOG

		Thickness	Top
PLEISTOCENE	Drift	185	0
MISSISSIPPIAN	Coldwater	815	185
	Sunbury	13	1025
	Berea	37	1038
	Antrim	187	1075
DEVONIAN	Traverse	43	1262
	Traverse Lime	190	1305
	Dundee	30	1495
	Detroit River	250	1525
	Sylvania	35	1775
	Bass Black	9	1810
	Bass Island	13	1819
SILURIAN	Salina	438	1832
	Niagaran	432	2270
	Clinton—Cataract	111	2702
ORDOVICIAN	Cincinnatian	676	2855
	Trenton Dolomite 3489—3510 Lime 3510—3515 Dolomite 3525—3530 Lime 3530—3650 Dolomite 3650—3870	339	3489
	Black River Lime and Shale 3870—3890 Dolomite 3890—3931	103	3828
	Glenwood		4073

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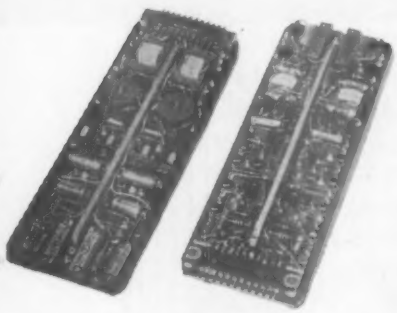

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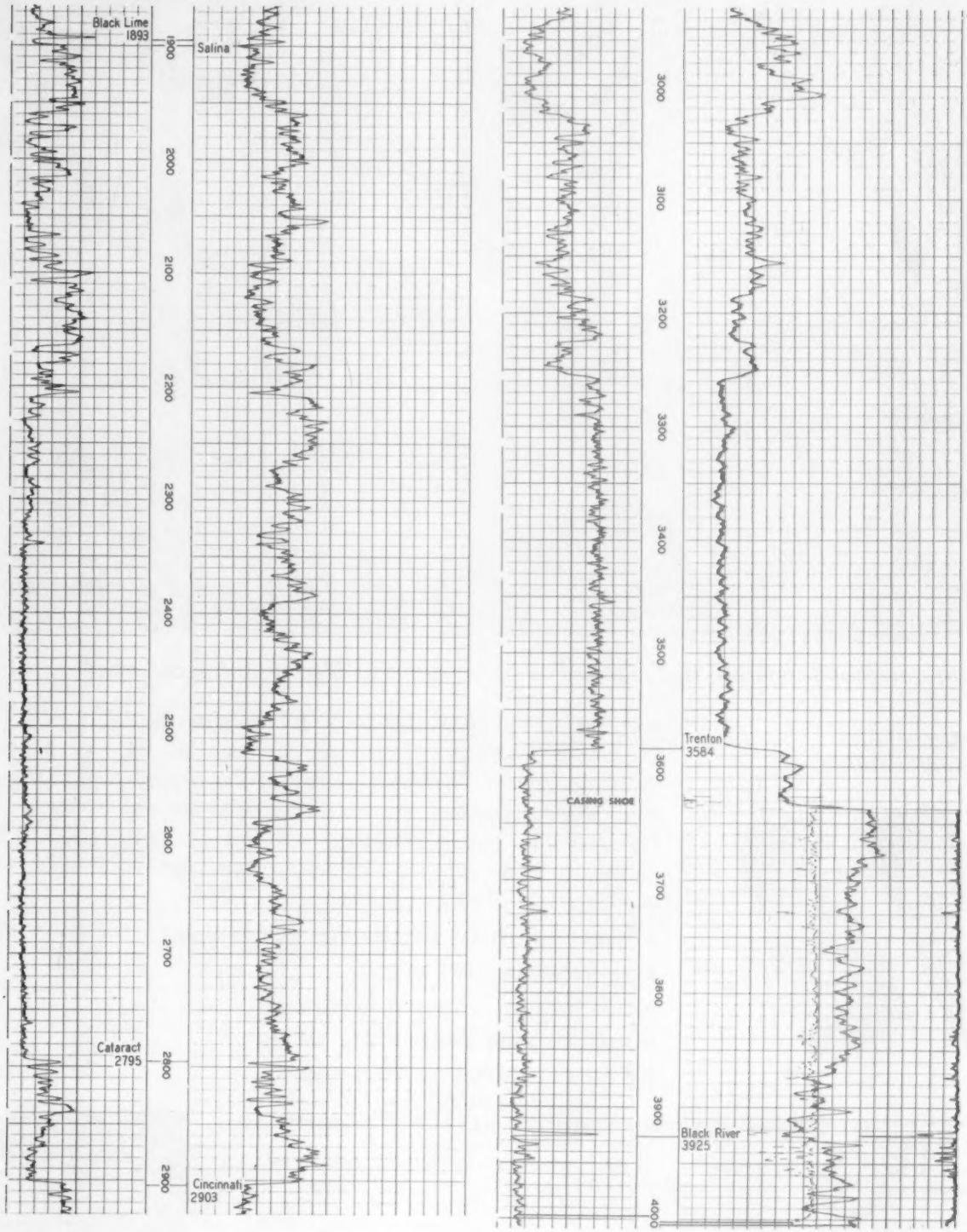
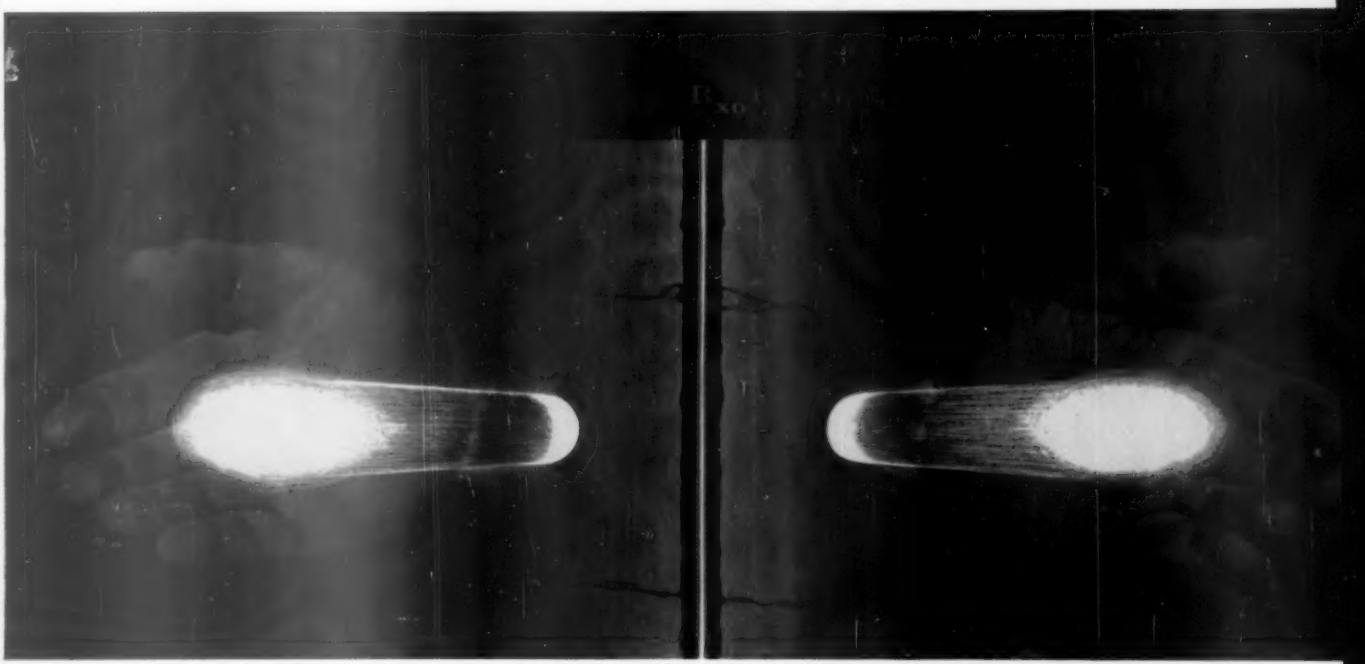
Generalized Section of a Scipio (Michigan) Field Well



The New Schlumberger Deep Induction Log

reaches twice as deep to give twice the contrast between water and oil



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Bell & Gault Drilling Co. (cable rigs)
Calvert Drilling Co.*

*Coming into Michigan in past 15 months.

threatened blowouts or total blowouts. A number of wells have drilled loss zones 200 ft. in the Trenton that were overcome only after weeks of delay and costs running as high as $150,000.

Completion. General completion practice is to drill to total depth with rotary, log the hole, and then perforate. Usually perforating is followed with 500 gal. mud cleaning acid and from 1,000 to 2,500 gal. regular 15% acid. Sand fracture with 450 bbl. oil and 10,000 to 15,000 lb. of sand also is common.

Closed-in pressures range from 1,500 to 1,700 psi. Flow pressures range from 1,300 to 1,600 psi.

Because of the overlying gas cap which apparently is well connected by vertical fracturing in the Trenton, most operators attempt to complete as deep in the oil section as possible. This generally has prevented high gas-oil ratios experienced on the earlier completions in the field.

Albion, where six wells now have been drilled inside the city, is the farthest north point of proven production. Going southeast, the oil pay in the Trenton graduates down to the point that in Adams, the farthest south end, the Trenton is nonproductive limestone with the only pay so far logged in the base of the Black River.

Completion depths are fairly constant with the regional dip northward, 30 to 40 ft. to the mile.

Newcomers rush in. Virtually all of the productive area to date is on leases taken before the 1959 boom emerged, of the production is on leases calling with the result that a considerable part for overrides from one-quarter to 50%. Three of the leading independent producers in the play are operating totally on farmouts.

The fairly liberal state allowable and indication of 8,000 or more barrels per acre recovery by primary methods has been a major inducement for newcomers to Michigan and the willingness to extend 50% overrides. Michigan's best pools from the Dundee have topped 20,000 bbl. to the acre average but the state average is less than 5,000 to the acre.

New companies to Michigan are accounting for about 30% of the drilling in the area.

Production. Production from the

LEADING OPERATORS IN SOUTHERN MICHIGAN

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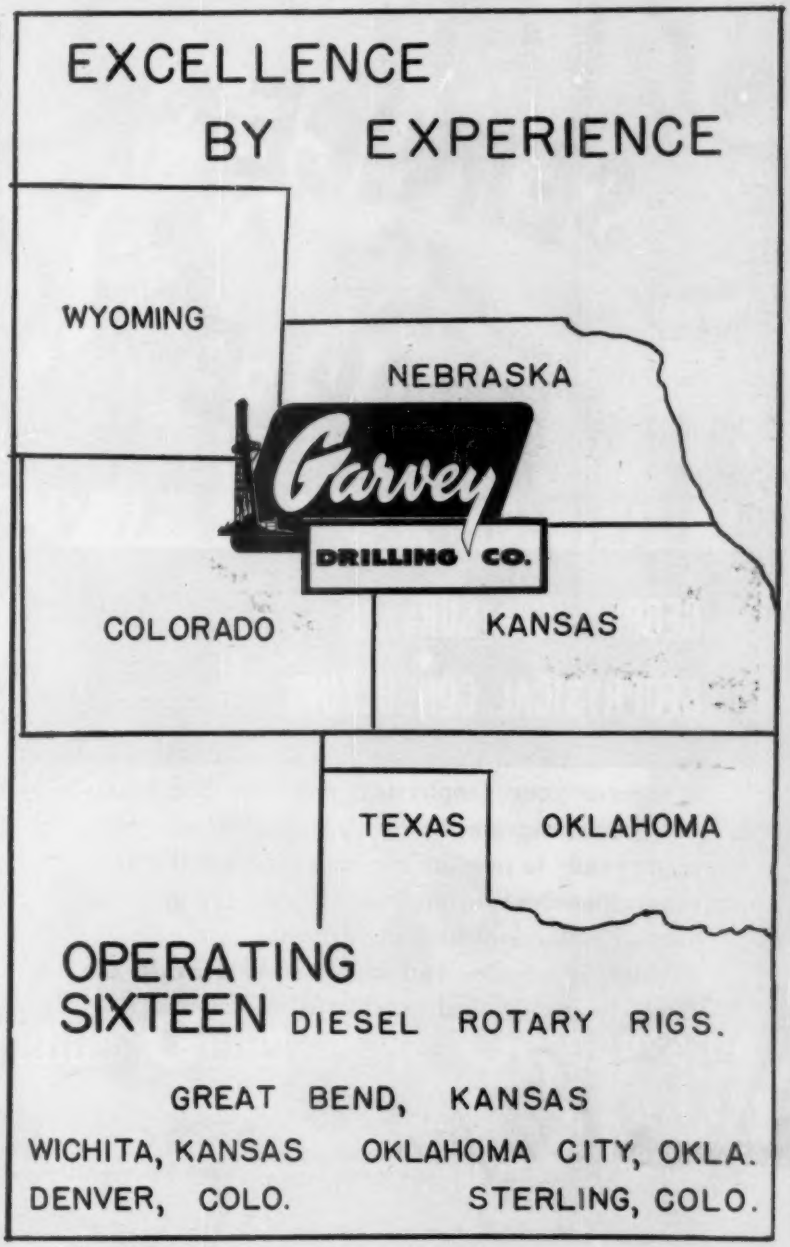
McClure Oil Co.*
Carter Oil Co. (Humble)*
Perry Fulk*
Mask & Wood*
Ohio Oil Co.*
Palmer & Cummins
A. Ed. Rovsek*
Bell & Gault Drilling Co.
Sun Oil Co.
Turner Petroleum Co.
Don Davis Drilling Co.*
C. A. Perry & Son
Union Development Co.
Frontier Petroleum Co.

*Most active on basis of drilled production and current development. Ohio and McClure's operations set the pace.



Trenton-Black River in 1959 stopped a statewide downward trend. The Scipio trend produced 2,063,940 bbl. oil in 1959 compared to the state total of 10,500,000 bbl.

As of December 1959, Scipio-Adams produced 213,859 bbl. of oil, Pulaski 46,994 bbl., and Albion 85,355 bbl. The top producing area outside of the Scipio trend was Coldwater in Isabella County, a 19-year-old field that produced 54,000 bbl. in December.

Outlets. Ohio Oil Co. is scheduled to start operating its new 8-in. line between Scipio and a pipeline junction north of Toledo late in February. To the present time all crude from the Scipio trend has been moved by truck.

Ohio also has a 25,000,000-ft. per day casing-head gas plant under construction, which when placed in service will mark the first use of flare gas in the field.

Prices. The posted price for Scipio trend crude is $2.95 a barrel, the same as for other Michigan fields. Average gravity is 42°. Three companies are active in gathering and purchasing: Ohio, Leonard Crude Oil Co., and Osceola Pipe Line Co.

Play is not over. Both gravity and seismograph crews are reworking the entire southern Michigan area at the present time. Previous gravity high charting has been the basis for considerable exploratory work. Harold McClure, Jr., who has been associated in four of the five oil discoveries in southern Michigan, recently predicted eventual discovery of "seven more oil trends" in southern Michigan.

A play of oddities. A few weeks ago a dry hole became a 30-bbl. per hour discovery. This well, McClure Oil Co. 1 Hergert in Hillsdale County, logged Trenton at 3,590 ft. after it had been drilled "dry" to 4,179 ft. McClure had shut down the 2 Hergert on the same unit at 1,025 ft. and moved rig off location. But, following company practice, an electric log was run on the No. 1 hole before plugging. It showed a 20-ft. section in Trenton as favorable. Then operators ran drill-stem test at 3,970 to 4,010 ft. and had gas to surface in 15 minutes and oil in 50 minutes. The well flowed 10 bbl. per hour by heads. Present theory is the hole missed a dolomite fracture by less than an inch.

Trend grows. Still on the same northwest "'ruler line" fracture, another major extension of the Albion-Scipio trend is McClure Oil Co.-Perry Fulk 1 Winter in Sheridan Township, Calhoun County. The well flowed oil on test of the Trenton. This newest sensation in the Trenton play is 3 miles northwest of Albion field, up to now the farthest northwest point in the 25-mile-long trend.

Michigan Drilling Data

SCIPIO TREND, Calhoun, Jackson, Hillsdale counties

On pump $60,000;		Dry hole	$34,000
Approx. cost of well:		Flowing	$55,000;
On pump $60,000;		Dry hole	$34,000

Cost averages: Footage price $550 to $600. Day: With pipe $750; without pipe $650.

Normal Rig-Time Distribution

% on footage rate	18	Total days	21
% on day rate	3	Total bits	16

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	16	180	250
	10	1,500	700
Oil string	7	4,250	150
or	5½	4,250	150

Typical Mud Program

Bentonite, oil, and lost-circulation materials.

Avg. Formation Tops (Drlg. Depth, Ft.)

Traverse	1,425
Niagaran	2,450
Trenton	3,750

Core Data

In 100 ft. of oil pay, est. recovery is 120 bbl./acre ft.

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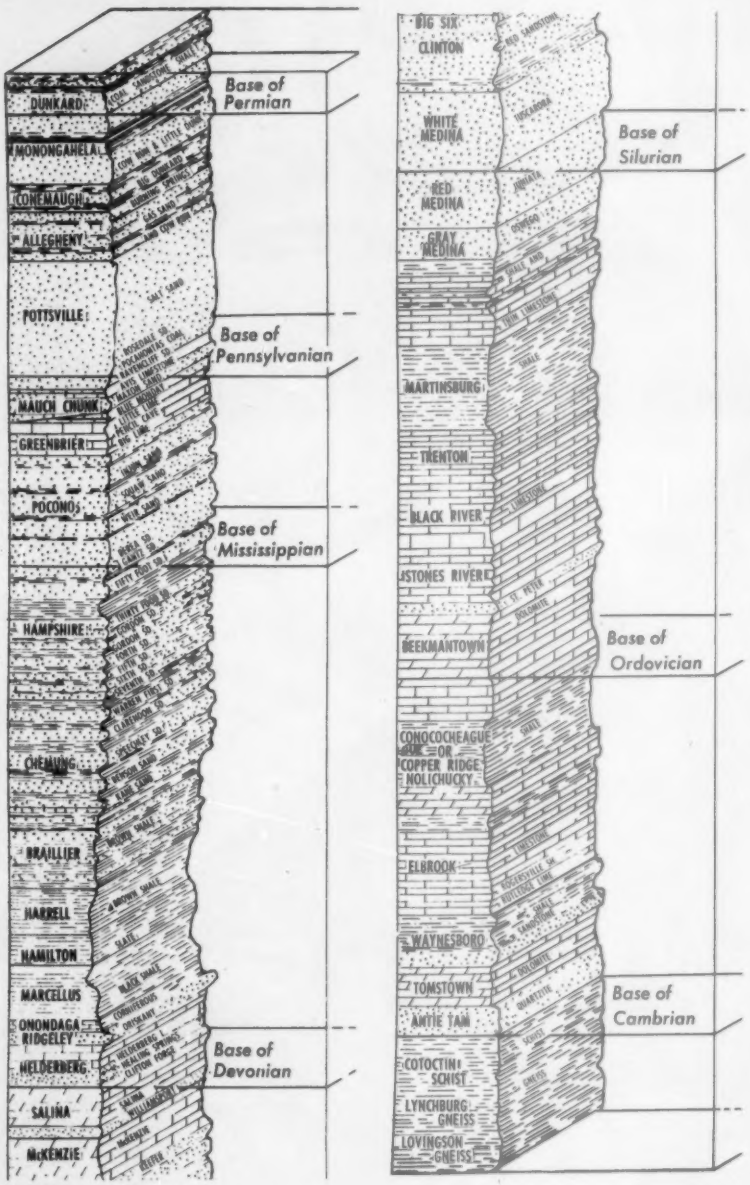
West Virginia wildcats 40% successful

THE PUSH to the lower part of the geologic column in the Appalachian basin continues strong in West Virginia. From a selected group of 10 deep wildcats drilled in the state last year, a 40% success ratio is tallied, pointing up the tremendous potential of Oriskany-Devonian and lower rocks in the basin.

Deep drilling in the Appalachian basin began several years ago, but didn't get into full swing until 1958. There were more deep wells drilled during the past 2 years than ever before. Of the 10 deep wildcats drilled last year, 4 were gas-field openers with average footage rising to 7,185 ft.

The deep hunters. Half a dozen operators are doing most of the drilling in West Virginia: United Producing Co., Inc.; Hope Natural Gas Co.; United Fuel Gas Co.; Columbian Carbon Co.; Godfrey L. Cabot, Inc., and Owens-Libbey-Owens Gas Department, all from Charleston.

Generalized Section of West Virginia



Current Wells

1. Randolph County, Huttonville district, Durbin Quadrangle. Hope Natural Gas. Co. 10182 West Virginia Board of Control. TD 6,173 ft. Well is capped over, waiting on completion of Well 10228. Chert 2,620-2,785 ft., Oriskany 2,785-2,935 ft., Helderberg 2,935-3,610 ft., Silurian 3,610 ft., lime-dolomite 6,114 ft.

2. Randolph County, Huttonsville district, Durbin Quadrangle. Hope Natural Gas Co. 10228 West Virginia Board of Control. Drilling to basement expected at 13,200 ft. TD 13,-121 ft. Ran 4½-in. at 10,650 ft. to test gas shows. Additional information tight.

3. Randolph County, Dry Fork district, Horton Quadrangle. Columbian Carbon Co. 2-GW-1293 D. H. Hill Arnold Consolidated. This is a deepening job. Drilling below 9,806 ft. Well is a proposed Clinton test. The original discovery well was completed in 1958 for a final open flow on chert of 553 M.c.f.d.; on Oriskany of 11,818 M.c.f.d. for total output of 12,371 M.c.f.d. TD 9,806 ft. Rotary moved. Cable tools in to test. Presently swabbing water at 3,200 ft.

4. Pendleton County, Circleville district, Spruce Knob Quadrangle. United Fuel Gas Co. 1 Ray Sponaugle. Drilling at 1,520 ft.

Current activity. Two deep gas fields and two shallow areas focus West Virginia drilling interest on Jackson, Randolph, Pocahontas, Nicholas, and Kanawha counties.

1. Glady field on the Blackwater anticline in Greenbank district, Durbin Quadrangle, Pocahontas County, is the state's most active deep field. Production is 26,000 M.c.f.d. from 29 producers. There are three wells drilling. Only three dry holes have marred this prolific field's success. Production is from chert and Oriskany-Devonian at 6,186 ft.

The field is 16 miles long, 2 miles wide. It takes in parts of both Pocahontas and Randolph counties. Gas has been turned into line, feeding during winter, shut in during summer. Hope buys the gas.

2. A deep field in Jackson County's Grant district, Belleville Quadrangle,

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has several Oriskany producers. Hope Natural Gas Co. drilled six producers with an open-flow potential of 7,897 M.c.f.d. Krennerman Oil & Gas Co., of Zelienople, Pa., drilled one producer. Kewanee Oil Co. drilled one dry hole and two gassers. Godfrey L. Cabot, Inc., has two producers.

All of the wells are producing after fracture of the Oriskany sand at below 6,100 ft. Gas Transport, Inc., of Lancaster, Ohio, buys and transports the gas. Last year's output was 1,000,000 M.c.f.

3. A shallow field in Nicholas County has proven quite lucrative. The unnamed area is in Hamilton district, Cowen & Summersville Quadrangle. Production is from Blue Monday sand, known locally as the Edray sand of Mississippian age. Production ranges from pay at 1,850 to 2,000 ft. There are 6 producers out of 11 wells drilled.

Hope Natural recently completed a 6-in. transmission line into the field. Average daily feed-in is 2,000 M.c.f. Production is regulated and restricted to 2,000 M.c.f.d., holding 375 to 400 psi. rock pressure because of water found in the pay zone.

4. Paint Creek field in Cabin Creek district, Kanawha County, Montgomery Quadrangle, is the most promising shallow area in the state. Pay is Weir sand at 2,100 ft.

Fourteen wells have been completed with an open-flow potential of 182,709 M.c.f.d., and an average of 735-psi. rock pressure. Three wells are staked for drilling, one is drilling.

As yet gas in the field has no market, because United Producing Co. wished to prove the field before contracting sale of gas. Extensive outlet facilities will be needed for handling the gas production. The firm recently began negotiations with several companies contemplating a sales-contract agreement. Production should hit market this spring. Price of gas in West Virginia ranges from 16 to 25 cents per M.c.f.; distillate prices from 8 cents per gallon or $2.56 per barrel.

Oil price in the state is $3.92 per barrel at wellhead.

The outlook. Deeper drilling in West Virginia has seen only a start. With the demand for gas growing throughout the country, particularly in the East, the drill will be plenty busy in the coming years searching out the Oriskany and even lower zones. Explorers will be looking for Cambro-Ordovician and even Cambrian production as a result of recent strikes in Pennsylvania and Ohio.

OHIO is one of the most active Eastern oil states as drillers head for the Clinton Silurian in most areas with deeper rocks in for a thorough search in 1960.

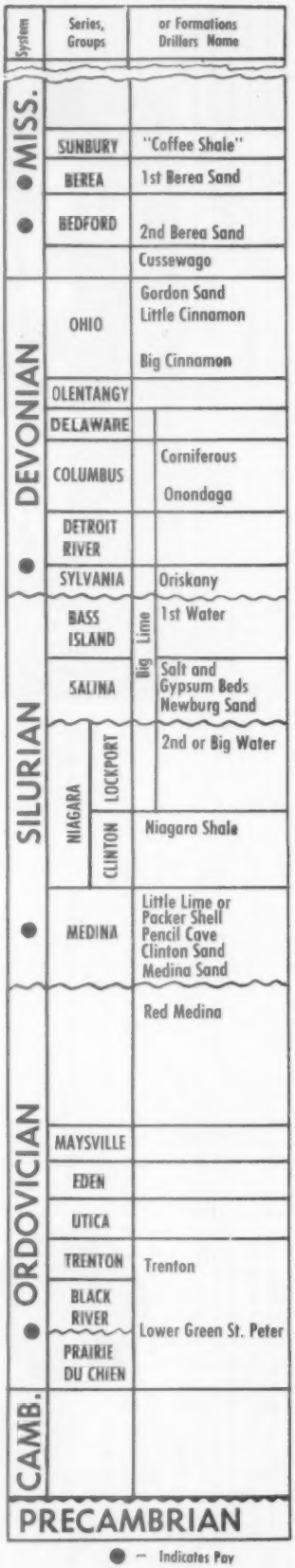
Operators like Ohio's favorable cost and regulation situation

IN OHIO, 1960 will see extensive testing of blocks held by majors who have recently entered the state to take advantage of a favorable cost and regulation situation. The average Ohio drilling runs about $7 per foot. Phillips Petroleum Co., holder of some 70,000 acres is dealing with Northern Natural Gas Producing Co., and has announced a 10-well wildcat program for Ashtabula, Portage, and Trumbull counties. Cable strings will be used to be followed by rotary to provide cost-comparison basis.

Sun Oil Co., recent opener of a new pay horizon, (Oriskany) in the Pierpont Township, Ashtabula County, well, has scattered blocks amounting to 100,000 acres, and plans extensive joint ventures with others to test holdings.

Consolidated Natural Gas Co., through East Ohio Gas Co. (at home in the area) and River Gas Co., (principally a purchaser but now initiating exploration activity), has East Ohio's holdings of 700,000 acres plus substantial acreage newly acquired by River Gas to serve as a base for testing.

In addition to the above majors whose 1960 programs are apparently firmed up, Gulf Oil Co. (50,000 acres), Ohio Oil Co. (50,000 acres), Mobil Oil Co. (25,000 acres), Kewanee Oil Co., and Continental Oil Co. also are in the state. Majority of these oper-



ators including Ohio Fuel Gas Co. (700,000 acres) and Preston Oil Co., are interested in Clinton development and in the possibilities of Cambro-Ordovician production, at least to the extent of planning farm-outs and participation ventures.

Clinton centers. Clinton Silurian sand exploration interest in 1960 will center on northeastern Ohio as well as possibilities of picking up another Wayne (2) (see map), or Vinton (3) County play along the old Clinton gas-producing belt (4). These successes are somewhat reminiscent of the history of the Canton-Stark field where an area thought fully developed was, after an interval of many years, re-drilled encountering virgin pressures.

Deep digging. Commercial Cambro-Ordovician interests rest on two producers to date, Ohio Fuel Gas Co., East Ohio Gas Co., Wiser Oil Co., 1A F. Smith, Hinckley Township, Medina County ("A") and the Monk Oil & Gas Co., 2 J. Monk, Bennington Township, Morrow County ("B"). Exact age of pay horizons in some 15 wells testing these zones over the past 2 years has not as yet been tagged.

Current interest. Current hot spots include Ashtabula County (identified as 1 on map) where 20 locations are now staked. The field was discovered in 1953 and to date some 50 wells have been completed, the major activity occurring during the past year. Active operators include Russell McConnell, Felmont Oil Corp., Belden & Blake, Devonian Gas & Oil, Union Carbide Corp., and Benedum & Trees. Drilling depths of 3,300 ft. test both the Oriskany and Devonian, newly found productive in the area, and the major pay, the Clinton sand. Production from the field brings 27 cents per M.c.f., East Ohio Gas Co. and United Natural Gas Co. taking the gas. The oil brings $2.72 per barrel.

Wayne County (2), which led the state in 1959 completions and will be a leader again this year, has 50 locations presently staked. Operators in the field are Ohio independents selling 24-cent gas to Ohio Fuel Gas Co. Oil production is of Corning grade and goes for $2.72 per barrel, primarily to Ashland Oil & Refining Co. The wells produce from three pays (Berea, Newburg, and Clinton) with a total depth of 3,400 ft. testing all three zones.

A third hot spot in Vinton County (3) picked up by Darrell Blanton, shows 18 staked locations, with Roberson-Williams, Ohio Fuel Gas Co., and John Dubach in on the play. Average depth to the Clinton is 2,800 ft. and Ohio Fuel pays 24 cents per M.c.f. for the gas.

Major wildcat program may start soon in Pennsylvania

IF ACTIVITIES of the past year are any indication, Pennsylvania and the northern Appalachian area should be the scene of a major exploratory drilling program in the immediate future.

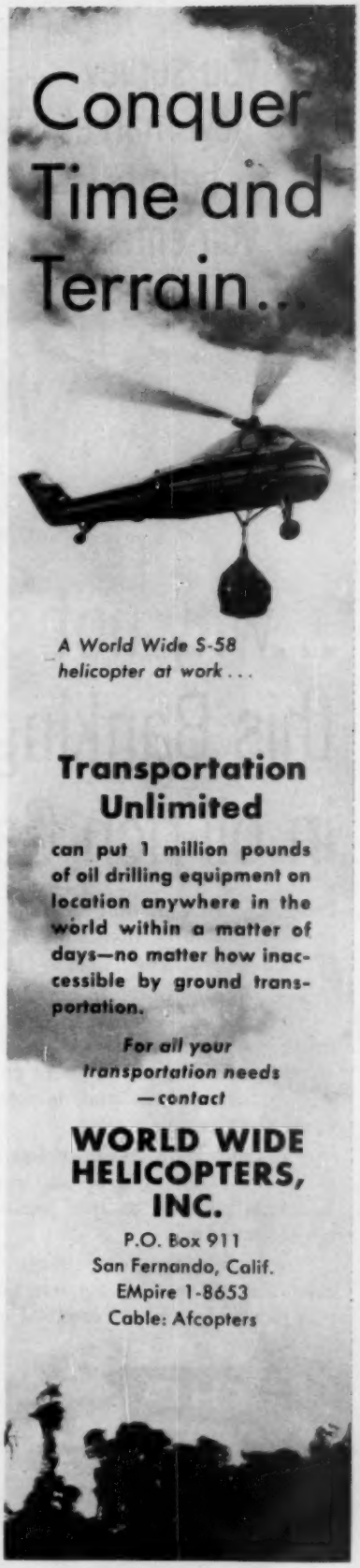
Big year seen. In 1959, active local companies and independents were joined by major companies which moved geological and land offices into the area for the first time. Thousands of acres of land were leased and seismograph crews were at a premium.

Oriskany objective. Statistics for last year show that the favorite objective of deeper drilling in Pennsylvania was the Lower Devonian Oriskany sandstone, an important natural gas-producing formation. Of the 124 deep wells drilled in Pennsylvania last year, approximately 90% had the Oriskany as their objective. The remaining 10% tested through the Clinton and Medina formations with a few penetrating to or through the Cambrian.

Drilling center. The center of deep drilling activity was in Clearfield and Elk counties where 80 rotary-drilled Oriskany tests were completed, 67 as gas wells. The average well depth in these counties is 7,093 ft. Completed wells producing into the line cost $80,000 to $90,000 and the field price of gas is 27½ cents per M.c.f., the prevailing price throughout the state for deeper production.

Of the remainder of Oriskany tests, most were drilled in the southwestern Pennsylvania counties of Fayette, Indiana, Somerset, and Westmoreland. The average producing depths in this area range from 7,300 ft. in Indiana County to 8,500 ft. in Somerset County where the deepest producing well in the state is located in Boswell field.

Most of the drilling with the Silurian, Clinton and Medina formations



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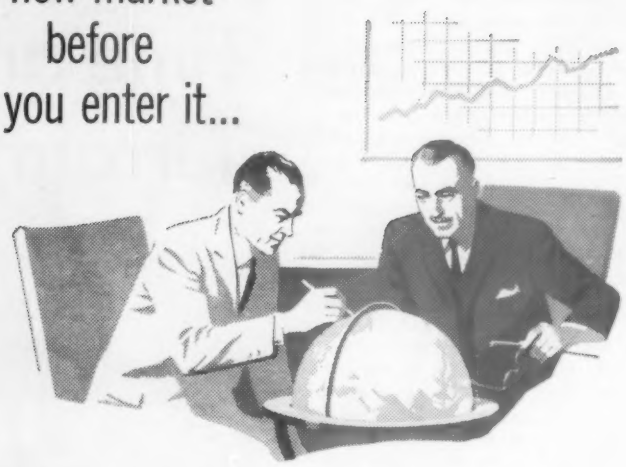

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as objectives was in northwestern Pennsylvania. Several small wells were completed in these formations in 1959 in Crawford and Erie counties. The average producing depth in this area is approximately 3,200 ft.

In Erie County, near the close of the year, the first apparent commercial gas production from the Cambrian was found. Operators are testing a flow of 750 M.c.f.d. from the Gatesburg formation at a depth of approximately 5,900 ft.

Drilling may shift. In the coming year, the Oriskany will still be the major drilling objective. The southwestward exploration of the stratigraphic type trap on the southeastern flank of the Boone Mountain and on echelon anticlines will, if successful, cause the center of deep drilling to shift into Jefferson County, Pennsylvania.

Oriskany exploration will be widespread, however, as the major companies, which recently entered the area, can be expected to start testing.

Strat traps. The emphasis will be on finding stratigraphic traps. Developments in the northwestern Clearfield area have pointed up the potential of this type of trap. In this area, Oriskany production was first developed on the northwestern flank of the Chestnut Ridge anticline, the crest of which had only a thin veneer of nonporous sand. Subsequently, gas production was developed on the southeastern flank of the parallel trending Boone Mountain anticline which had no Oriskany sandstone on its crest. Within the last few months, these two producing areas were proven to be joined around the northeastern rim of the southwestward plunging syncline which separates the two folds.

In the northwestern part of Pennsylvania, the limited exploration success of the past year will undoubtedly lead to an increase in both exploratory and development drilling to the Clinton and Medina formations.

Cambrian objective. The successful Cambrian well in Erie County will maintain interest in the area and should lead to an increase in the number of tests with Cambrian and Ordovician formations as objectives since major company lease holdings are large in this section of Pennsylvania and adjoining Ohio.

Good gas market. Natural gas continues to find a ready market in Pennsylvania with local utilities buying all that is produced. Major purchasers of locally produced gas are companies of the Consolidated and Columbia systems.

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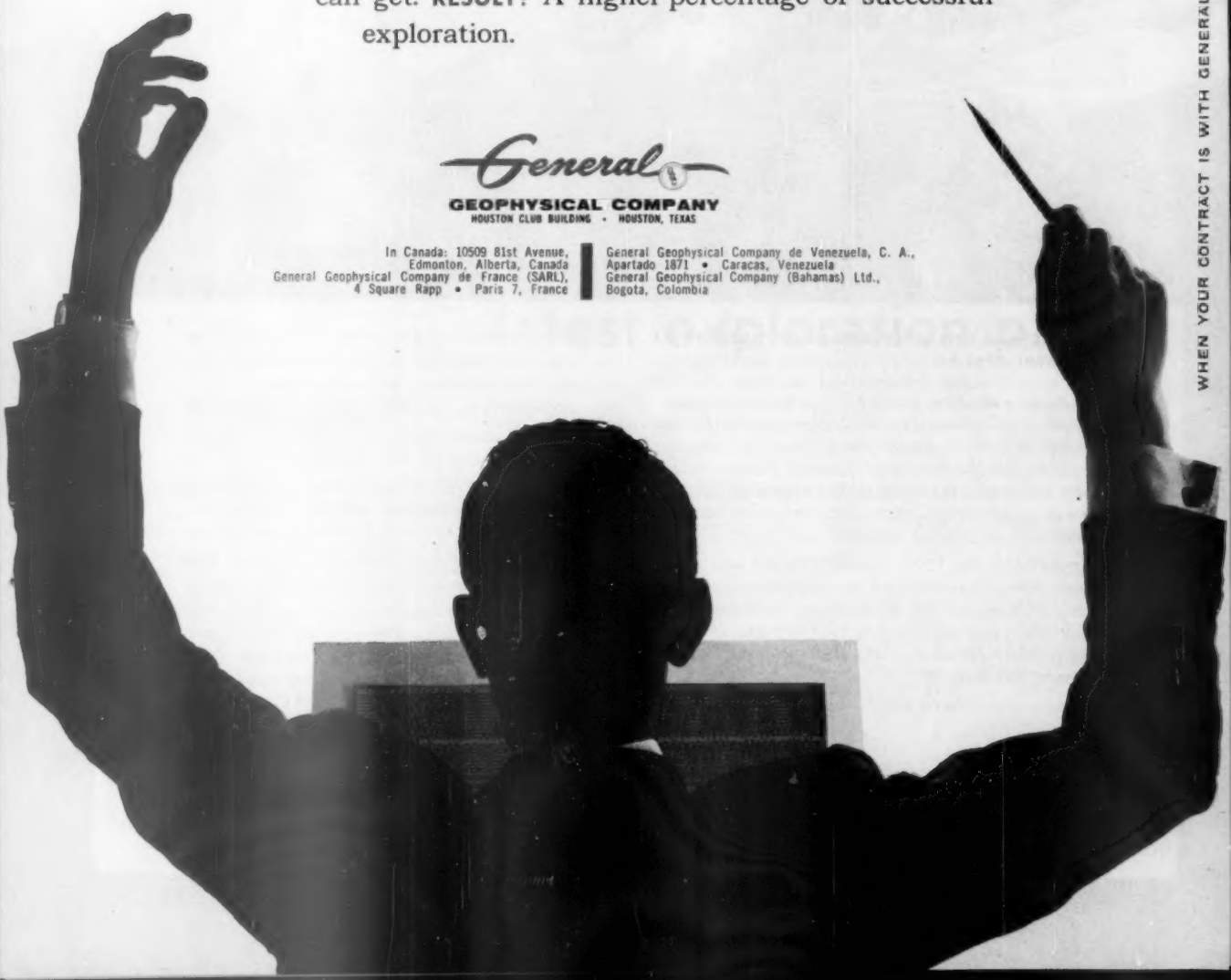

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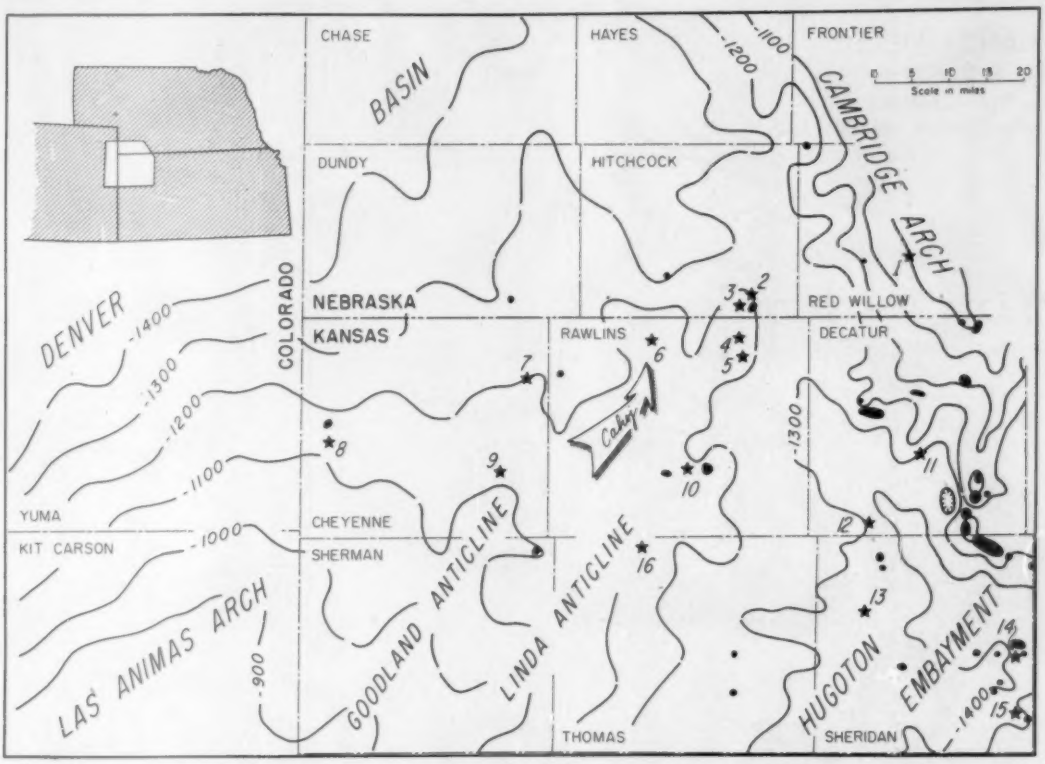


DISCOVERIES in 1959 are marked by stars; (1) Ackman, (2) Frakes, (3) Reiher, (4) Wilheim, (5) Kompus, (6) Cahoj, (7) Ken, (8) Rueb So., (9) Alexander, (10) Arbor, (11) Vavroch, (12) Prairie Dog, (13) Parnell, (14) Studley So., (15) Custer NW, (16) Lanisia. **Fig. 1.**

Kansas-Nebraska—Mid-America's latest exploration payoff

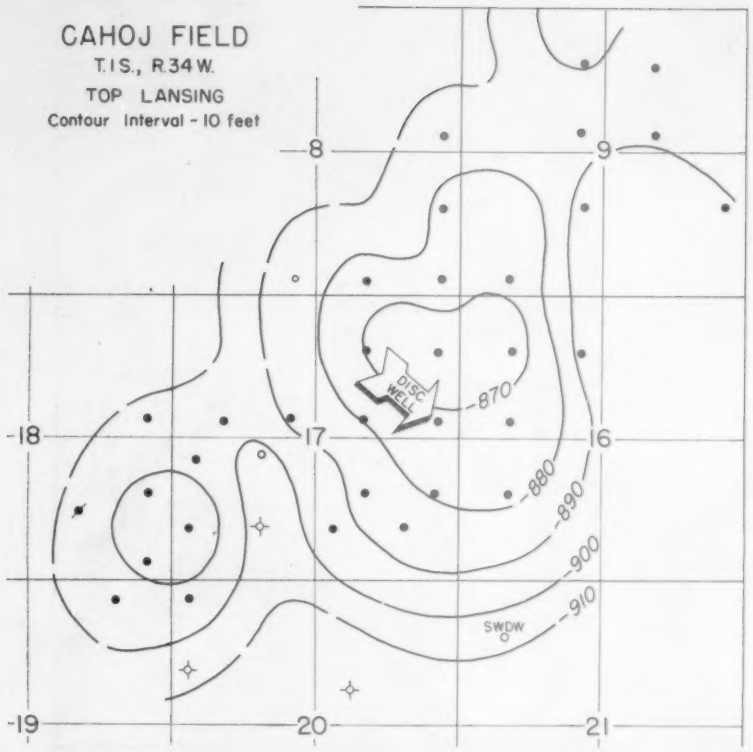
BY EDWIN D. GOEBEL AND DANIEL F. MERRIAM
Kansas Geological Survey

DURING 1959, impetus given to exploration in the northern Hugoton embayment (northwestern Kansas and southwestern Nebraska) by the 1958 discovery of Phillips' Llanos multipay field in Sherman County culminated in two important Skelly multipay strikes, Reiher in Hitchcock County, Nebraska, and Cahoj in Rawlins County, Kansas. In addition, 14 other new fields were opened in a nine-county area (Fig. 1). Up to the present, oil production is entirely from Pensylvanian beds, but other possibilities, especially in pre-Pennsylvanian strata, are excellent. The present high ratio of success, combined with the multizone attraction and enhanced by reasonable drilling and completion costs, assures considerable drilling for the next few years.

Llanos was the spark. Although Lansing-Kansas City (Pennsylvanian) zones were opened in Adell field on

TABLE 1—DRILLING IN KANSAS AND NEBRASKA DURING 1959

	Oil	Dry	Total	Footage
KANSAS				
Cheyenne County	6	14	20	101,862
Rawlins County	33	27	60	279,846
Sherman County	6	7	13	67,112
Thomas County	1	9	10	49,365
Total	46	57	103	498,185
NEBRASKA				
Dundy County	0	2	2	10,619
Hitchcock County	2	4	6	27,540
Red Willow County	1	3	4	16,756
Total	3	9	12	54,915

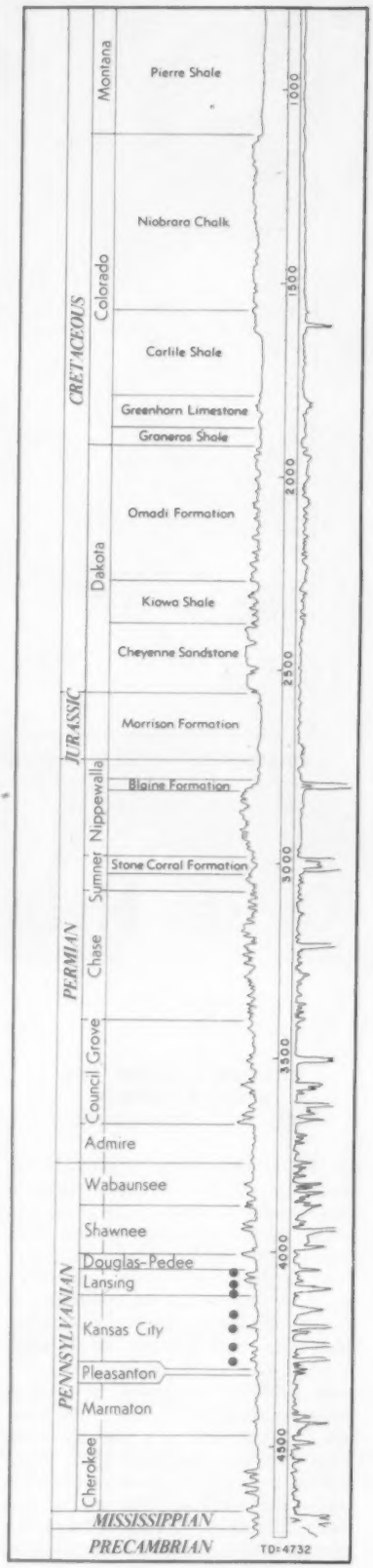


STRUCTURE MAP of Cahoj field contoured on top of Lansing Group on a 10-ft. interval. Two and possibly three areas having closure of 10 to 25 ft. are indicated. Future development seemingly will take place to the northeast. Fig. 2.

the Cambridge arch to the northeast as early as 1944, subsequent evaluation seemed to doom development of the adjoining basin. Reported discoveries caused flurries of excitement periodically, but most were soon abandoned. A few enterprising companies and individuals wildcatted the country, but found all too little reward—in short, the area was disappointing. Then came the big break—Llanos—and the rush was on. As a result, the potential of the area is now being recognized with continued exploitation. In Dundy, Hitchcock, and Red Willow counties (Nebraska), and Cheyenne, Rawlins, Sherman, and Thomas counties (Kansas), 115 wells penetrated a total section of 553,000 ft. in 1959, an average of slightly less than 5,000 ft. per well (Table 1). Cost of tests to the Precambrian ranges from about $15,000 to $25,000, and for completion as much more. Because few leases are available, farmouts from major lease-holders are common practice.

The northern end of the Hugoton embayment is bounded on the east and northeast by the Cambridge arch and subsidiary structures, and on the west and northwest by the Las Animas arch and its subsidiary features (Fig. 1). The extreme southeastern flank of the Denver basin is evident just northwest of the Las Animas uparched complex. The present structural configuration is mainly a composite of late Paleozoic and late Mesozoic structural movement; however, the tectonic history is complicated by the presence of the older Transcontinental arch. Distribution of various pre-Pennsylvanian rock units is controlled by major positive elements, in that the sediments have been stripped from their crests. Sections are therefore thickest in adjoining basinal areas and, generally speaking, thin over crests of structural highs. Many minor but prominent and oil-bearing anticlines are associated with the major structures, for example, the Cahoj (Fig. 2).

Rocks range in age from Precambrian to Recent (Fig. 3). Reagan



GRAPHIC REPRESENTATION of the electric log of the Skelly 1 Cahoj well (SE¼ SE¼ NE¼, 17-1s-34w) showing stratigraphic sequence of rock units in northwestern Kansas. Zones that produce in this prolific field in Rawlins County are shown by heavy dots. Fig. 3.

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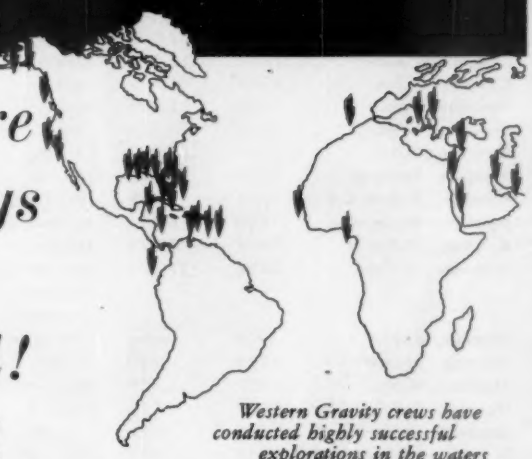

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(Cambrian), Arbuckle (Cambro-Ordovician), Simpson, Viola (Ordovician), and Mississippian rocks are truncated along margins of the uplifts, so that the Pennsylvanian oversteps and lies on beds as old as Precambrian. The Pennsylvanian is overlain by beds of Permian, Jurassic, Cretaceous, Tertiary, and Recent age. Pre-Pennsylvanian beds are composed mainly of carbonates, whereas the Pennsylvanian and Permian consist of alternating shale and limestone, and some sandstone. Many of the limestone beds pinch out to the north and west. The Upper Permian and Jurassic sequence contains clastics and evaporites; the Cretaceous and Tertiary is composed mainly of clastics, with exception of the Greenhorn and Niobrara limestones. Almost any pre-Graneros unit (Precambrian excepted) that meets specifications of a reservoir rock can be considered an objective, although best possibilities other than Pennsylvanian presumably are in pre-Pennsylvanian beds.

Reiher and Cahoj fields were opened by Skelly Oil Co. (Table 2). The final pump potential of 348 bbl. per day from the Reiher discovery well in Nebraska from three zones in the Lansing-Kansas City is the largest of any well completed in southwestern Nebraska outside the Denver basin. An initial potential of 3,000 bbl. a day was assigned the discovery well of Cahoj field in Rawlins County. A total of 29 wells had been completed in Cahoj field by the end of 1959; 8 had an initial state potential in excess of 2,000 bbl. per day each. Presently 33 wells are on pump. The field will probably be a 50 to 60-well field. Production to the end of 1959 from the field, which was discovered in midyear, exceeded 50,000 bbl. of oil. Production from the eight-well Reiher field during 1959 also exceeded 50,000 bbl. of oil. The 33° to 37°-gravity crude is being taken by Rock Island Refining Corp.

Seismic and core-drill activity in four northwestern Kansas counties gives an indication of the intensity of the play. About 92 crew weeks or almost 15 percent of the state's total geophysical exploration was concentrated in Cheyenne, Rawlins, Sherman, and Thomas Counties in 1959. This effort, however, is justified as almost all discoveries have resulted from interpretation of seismic information using techniques adjusted for the region.

A good example of the accelerated activity is Cheyenne County where 20 wells were put down in 1959, although prior to last year only 15 tests had been drilled. Three new Cheyenne County fields brought in during 1959 were Alexander, Ken, and Rueb South. Ken field, discovered by Phillips Petroleum Co. has Cherokee production, and the discovery well was given 93 bbl. a day initial potential. Rueb South field (Lansing) was brought in by R. J. Lawton, and initial potential from the discovery well was 95 bbl. a day. Alexander field, opened by Saffa and Brauer, had an initial potential of 84 bbl. a day from the Marmaton.

Arbor, Cahoj, Kompus, and Wilheim are the four Lansing-Kansas City fields opened in Rawlins County during 1959. The Arbor discovery well was given 80 bbl. a day, Kompus 30, and Wilheim 258 bbl. a day initial potential. Of these fields, Arbor was discovered by Amerada Petroleum Corp. the others by Skelly Oil Co. Lanisia in Thomas County was unveiled by J. O. Farmer and Musgrove in December 1959 and had an initial potential of 211 bbl. a day from the Tarkio (Wabaunsee).

In three Nebraska counties 12 wells were drilled in 1959, of which 3 were successful. These are the discovery wells of Frakes and Reiher fields in Hitchcock County and Ackman field in Red Willow County. The Frakes and Reiher are new Skelly discoveries whose combined initial potentials amount to 532 bbl. per day. In Reiher field seven wells were developed in addition to the discovery well. Crude from the Reiher is taken by Rock Island.

Although no new fields have been opened thus far in 1960 in Midamerica's latest hot spot, renewed drilling following the severe winter should reactivate the search for the exploratory payoff.

TABLE 2—ACTIVITY IN KANSAS AND NEBRASKA DURING 1959

County and field—	Year disc.	Production, bbl.	Producing zone	Top pay	No. wells	IP, bbl./day, disc. well
			KANSAS			
Cheyenne, Alexander	1959	none	Marmaton	4,765	1	84
Cheyenne, Ken	1959	2,070	Cherokee	4,768	1	83
Cheyenne, Rueb	1958	12,775	Lansing	4,537	2	60
Cheyenne, Rueb So.	1959	1,499	Lansing	4,504	1	95
Rawlins, Arbor	1959	5,065	Lansing	4,053	1	80
Rawlins, Brumm	1956	7,356	Lansing	4,312	3	30
Rawlins, Cahoj	1959	50,332	Lansing	4,050	29	3,000
Rawlins, Kompus	1959	390	Lansing	4,069	1	30
Rawlins, Sappa Creek	1958	8,789	Marmaton	4,430	2	115
Rawlins, Waterman	1958	6,194	Marmaton	4,280	1	120
Rawlins, Wilheim	1959	5,074	Lansing	4,061	2	258
Sherman, Llanos	1958	127,675	Lans.-K. C. Marmaton Cherokee	4,804	9	319
Thomas, Kindig	1956	none	Cherokee	4,595	1	401
Thomas, Lanisia	1959	390	Tarkio	3,739	1	211
Thomas, Mingo	1952	1,457	Marmaton	4,680	1	50
Decatur, Prairie Dog	1959	578	Lansing	4,033	1	99
Decatur, Vavroch	1959	none	Lansing	3,776	1	140
Sheridan, Custer NW	1959	611	Lansing	3,983	1	91
Sheridan, Parnell	1959	392	Lansing	3,971	1	140
Sheridan, Studley So.	1959	1,645	Lansing	3,786	1	30
			NEBRASKA			
Dundy, Jones	1957	none	Lans.-K. C.	4,184	3	20
Hitchcock, Burr Oak	1958	25,313	Lans.-K. C.	3,862	2	143
Hitchcock, Frakes	1959	12,672	Lans.-K. C.	3,890	2	183
Hitchcock, Hudson	1958	none	Lans.-K. C.	4,082	1	65
Hitchcock, Reiher	1959	52,700	Lans.-K. C.	3,816	8	348
Red Willow, Ackman	1959	4,697	Lans.-K. C.	3,200	3	...
Red Willow, Barger	1956	9,341	Lans.-K. C.	3,864	2	240
Red Willow, Poore	1957	3,121	Lans.-K. C.	3,644	1	60

Acknowledgment

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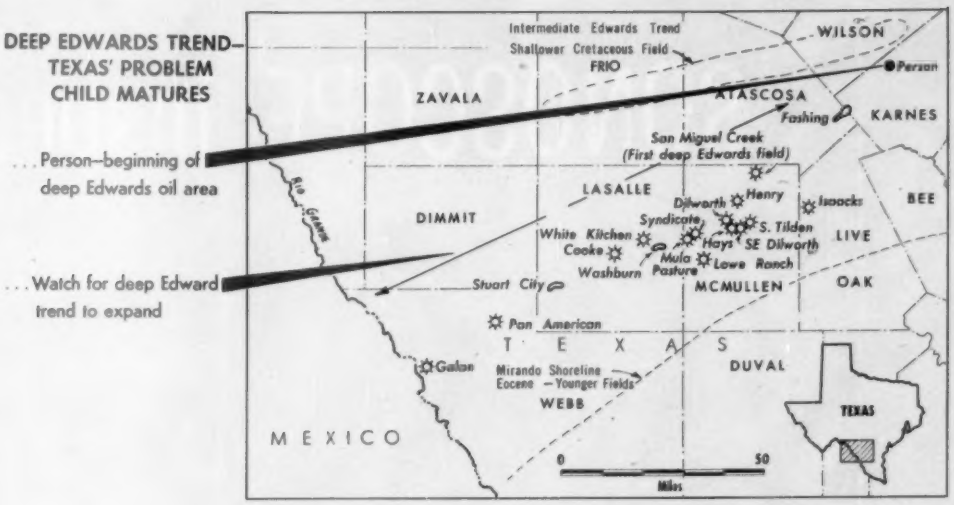

Deep Edwards play is bright hope in South and Southwest Texas

THE DEEPER coastward downdip phases of the Lower Cretaceous-Edwards horizon continue to provide South and Southwest Texas with one of its most intriguing and enticing trend plays.

It is a play that has accounted for the discovery of Edwards production in a string of 18 fields stretching more than 140 miles from far-western Webb County northeasterly through LaSalle, McMullen, southeastern Atascosa, northern Live Oak, and northern Karnes counties.

Problems and economic uncertainties that beset early exploration of the "deep" Edwards potentialities and restricted development rapidly are being dispelled. The play now is being resolved into a major potential source of new production.

Possibilities of the deeper Edwards phases have attracted wildcatters as far back as 1940 when a deep test, the first, drilled by Quintana Petroleum Corp. in the Washburn area of eastern LaSalle County blew out while running a drill-stem test in that horizon.

Humble rolls ball. Scattered occasional deep tests drilled in succeeding years also had either blowouts or teasing gas showings. But it was not until after late 1953 when a deep test drilled by Humble Oil & Refining Co., at San Miguel Creek, in northern McMullen County, was completed as the

Deep Edwards Trend Fields

Field and County	Discovery year	Discovery company	Prod. depths (ft.)	Type production	Prod. wells comp.	Structure	Other pays
San Miguel Creek, McMullen	1953	Humble	9,980-10,182	Gas-Cond.	2	Deep Salt Dome	Wilcox
Stuart City, LaSalle	1954	*Stanolind	10,028-10,232	Dry Gas	10	Reef	.....
Washburn, LaSalle	1954	Standard (Texas)	10,228-10,346	Gas-Cond.	2	Reef	Wilcox
Syndicate, McMullen	1955	H. R. Smith	10,658-10,682	Gas-Cond.	1	Reef	.....
Southeast Dilworth, McMullen	1955	Standard (Texas)	11,170-11,270	Gas-Cond.	2	Reef	.....
South Tilden, McMullen	1955	Producers	11,410-11,556	Gas-Cond.	3	Reef	Wilcox
Cooke, LaSalle	1956	*Stanolind	10,233-10,352	Dry Gas	3	Reef	.....
Hays (S. W. Tilden) McMullen	1956	Texas East.-Prod.	11,260-11,305	Gas-Cond.	1	Reef	.....
Henry, McMullen	1956	Standard (Texas)	10,040-10,209	Gas-Cond.	3	Deep Salt Dome	Carrizo
			10,549-11,060	Gas-Cond.			
Lowe Ranch, McMullen	1956	Amerada	13,950-14,479	Gas (Sweet)	1	Flexure-Facies change	Wilcox
White Kitchen, LaSalle	1956	Lee Brothers	10,303-10,430	Dry Gas	2	Reef	Carrizo
Fashing, Atascosa-Karnes	1956	Lone Star	10,400-10,550	Gas-Cond.†	55	Fault-Associated Reef	Carrizo
			10,650-10,900	Gas-Cond.			
Mula Pasture, McMullen	1957	Jupiter	10,530-10,075	Dry Gas	1	Reef	Wilcox
Isaacks, Live Oak	1957	Standard (Texas)	12,456-12,736	Dry Gas	1	.....	.....
Dilworth, McMullen	1957	Humble	10,670 10,765	Gas-Cond.	1	Salt Dome	Pettus - Carrizo - Wilcox
Galan, Webb	1958	Copana	8,970- 9,014	Dry Gas	1	.....	.....
Unnamed, Webb	1959	Pan American	10,000-10,020	Dry Gas	1	Reef	.....
Person, Karnes	1959	Brazos	10,886-10,950	Oil	11		
			10,912-10,958	Oil	11	.....	.....

*Now Pan American Petroleum Corp. †Oil production indicated in one well.

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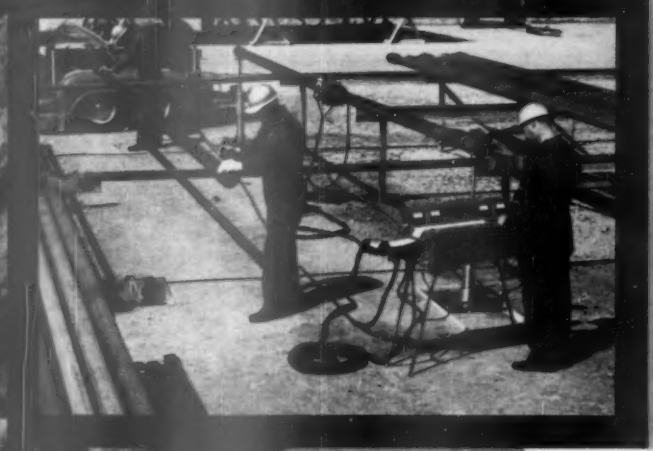

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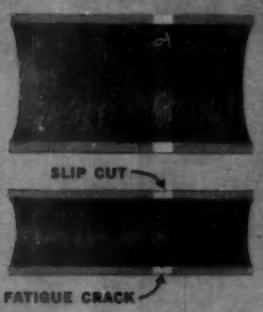

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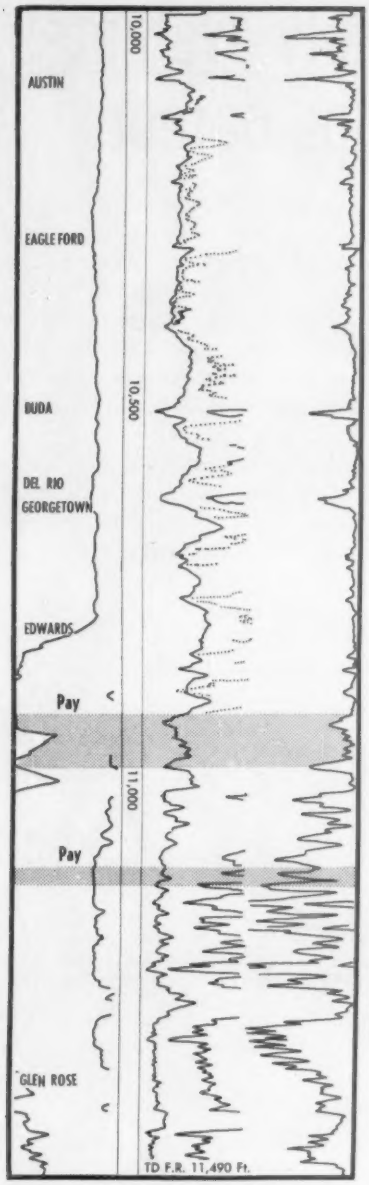


ELECTRIC LOG below Austin formation in Shell Oil Co.'s 1 Kotara-Janysek, offset to new Person oil field's discovery well, shows Edwards pay zone.

first commercial deep Edwards well, that the play actually got under way in earnest.

This well was productive of gas with calculated open-flow potential of 70 M.M.c.f. daily with a daily liquid recovery of 1,050 bbl. With no market outlet for the gas, the well has been shut in since completion until recently. Only within the past month has another Edwards well been completed in that field.

Discovery last August of first deep Edwards oil production in a 20-mile northeasterly extension of the trend at Person, in northern Karnes County, has raised the stature of importance and given added stimulus to the play.

Previously, all production had been gas and condensate. In view of the remoteness of some of the fields and general absence of pipeline connections, wells in most instances had to be shut in at completion. Also, much of the gas had various degrees of hydrogen sulfide content, requiring facilities for its handling.

All this has not been conducive to development of fields found. Only in a few of them have more than one or two wells been drilled. Prospects of not being able to produce wells when completed also had a tendency to discourage exploratory drilling except that required. This situation relatively recently has been relieved by extension of pipeline connections and market outlets to some of the fields, thus opening the way for more extensive development and exploration.

The Person oil discovery, rated as possibly the most significant single development in the Deep Edwards play since the discovery of the prolific Fashing gas-condensate field, has occasioned and inspired a comparatively active development program. Eleven wells with production from two zones, both 38°-40° oil, have been completed. Six rigs now are working in the immediate area. Brazos Oil & Gas Co., the discovery operator, has been joined in the development by Shell Oil Co., Earl Rowe and Argo Oil Corp., and Standard Oil Co. of Texas.

Since discovery of Person field, oil production also virtually has been assured at Fashing, on the Atascosa-Karnes county line, and, except for Person, the most northeasterly in the line of Deep Edwards fields.

Fashing. Fashing, discovered by Lone Star Producing Co. in 1956, is the only one of the Deep Edwards gas-condensate fields to receive large-scale development. More than 55 wells have been completed in a well-designed development program to supply needed gas for processing plants and pipeline outlets placed in operation the past year. Nine operating companies or groups have had a part in the development. At times a dozen or more rigs were kept busy in the field, productive from two zones.

Fashing's virtually assured oil production has been in a well drilled by Christi, Mitchell & Mitchell at the extreme northeastern end of the field. A good flow of oil was obtained in preproduction drill-stem tests of perforated interval at 10,844-52 ft., slightly below the depths of the field's two established zones of gas-condensate production. The well has been completed in one of the gas-condensate zones at 10,788-10,803 ft., but will be dually completed later taking in the oil zone.

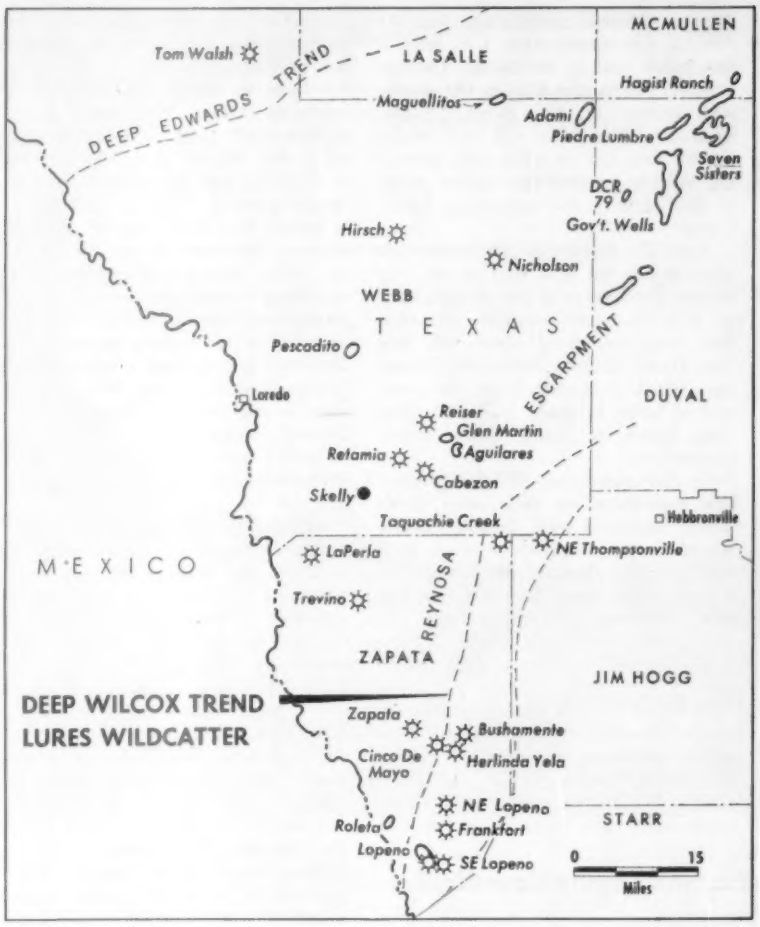
Latest significant development in the Deep Edwards play is an indicated 60-mile farther-northeasterly extension of the line of production into Lavaca County, in the middle coastal region (not shown on accompanying map). There, in deeper exploratory drilling in the Word-Wilcox area southwest of Halletsville, Mobil Oil Co. is testing gas and condensate found in the Edwards at 13,320-14,278 ft. Flow through ¼-in. choke was at the daily rate of 1,300 M.c.f. of gas and 8 bbl. of liquid. Only one other well, located at Lowe Ranch, in McMullen County, has tested the Edwards at greater depths. Mobil's discovery is from 30 to 35 miles coastward from the old shallow-Edwards line of fields along the Balcones and Luling fault trends.

Three reservoirs. Three types of reservoirs have been recognized so far. There are those associated with salt domes, typified by Dilworth, in McMullen County, where the salt mass was drilled into in the initial well at 7,600 ft. Two other fields, San Miguel Creek, and Henry, in McMullen County, are believed to be associated with deeply seated salt domes although the salt masses there have not been touched to far.

Lowe Ranch field, also in McMullen County, is identified with flexural thickening and facies changes. This field so far is the only one of this type. It is among the farthest downdip fields along the play. In its discovery and so far only well, drilled by Amerada Petroleum Corp. in 1956, the pay is at the greatest depth, (13,950-14,479 ft.) yet found. Unlike in most of the deep Edwards fields, its gas is sweet.

All other fields so far appear to be associated with reefing.

Only in Galan field, in western Webb County, is the Edwards productive at depths shallower than 10,000 ft. Discovery well, the only one so far, was completed at 8,970-9,014 ft. This field, opened by Copana Oil Co. in 1958, is the most southwesterly of the fields along the play. Only a few miles from the Mexican border, it extended the line of fields more than 35 miles to one of the trends most remote locations. Since its discovery, Pan American Petroleum Corp. has found Edwards productive in a lone well in northern Webb County between Galan and Stuart City, the next nearest field, in southwestern LaSalle County.



Lopeno trend gas finds look good in South Texas

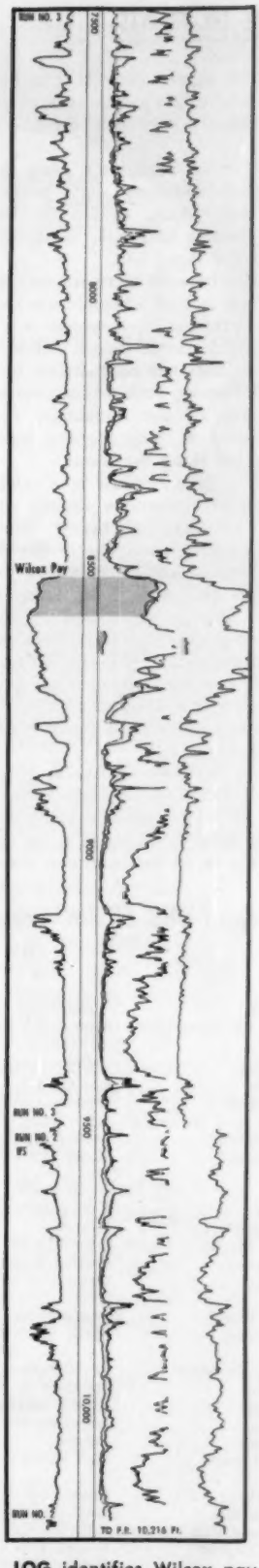
A PROLIFIC new source of gas production in far South Texas appears to be developing in continuing exploration of deeper Wilcox sands along what might be designated as the Lopeno trend.

The trend now begins with Lopeno field at the south tip of Zapata County, on the Mexican border. It extends northeasterly through eastern Zapata County, across the northwestern corner of Jim Hogg and Webb counties, and thence eastward through Duval and northward through LaSalle and McCullen counties to link with other Wilcox development far up and paralleling the coastline.

In far South Texas, it roughly follows the prominent Reynosa escarpment and old Mirando shoreline. Along these features are some of the state's oldest fields and densest production from shallower horizons, principally Jackson and younger sands.

Lopeno itself is an old Queen City gas-producing area, dating from 1934, with sands from 2,000 to 2,700 ft. First deep test was drilled there in 1952 by Standard Oil Co. of Texas. This well, 1 Ramirez, at the southeast end of the shallow-sand area on Standard's 60,000-acre block, logged at least five gas-productive zones in Wilcox sands from 7,000 to 10,180 ft.

It was this well that drew first major attention to the potentialities of the deeper phases of the Wilcox section. One Wilcox well previously, in 1949, had been completed in the county. This was at Cinco De Mayo, more



LOG identifies Wilcox pay zone in Gulf Resources, Inc., 1 Manuel Ramirez.

than 10 miles north of the Lopeno well, where completion was in pay at considerably shallower depths (2,200 ft.).

Following Standard's deep discovery, Delhi Oil Corp., on a farmout in the same block, drilled the second well about a half mile north. It was completed April 13.

Partly because of remoteness of the area and lack of adequate market outlets, no further development was done until 1955. Since then a steady series of deep tests has been drilled by various operators, both around the southeast side of the immediate Lopeno area, and at long stepout locations northeast along the trend.

These have resulted in a close succession of discoveries already stretching a distance of nearly 20 miles northward. Included are the Southeast Lopeno and Bushamente discoveries by Gulf Resources, Inc.; Northeast Lopeno, by Jonnell Gas Co.; Herlinda Vela, by Katz Oil Co.; another (unnamed) by Frankfort Oil Co., first in line north of Lopeno; and just this month a long stepout and confirmatory discovery for the Northeast Lopeno area.

Deep Wilcox exploration got a big boost in 1959 by two discoveries more than 25 miles farther north. One was by Atlantic Refining Co. at Taquachie Creek, in the northeast corner of Zapata County. The other was by Austral Oil Exploration Co. only a few miles east at Northeast Thompsonville across the line in the northwest corner of Jim Hogg County. Both are just south of the Webb County line, and on a line with spreading Wilcox development farther north in that county and adjoining Duval County.

Austral's Northeast Thompsonville discovery is the first, and so far only Wilcox production in Jim Hogg County. It is in the old shallow-sand Holbein area stretching across the line into Duval County Atlantic's Taquachie Creek discovery is at the south end of large Mirando Valley shallow area, locale of South Texas' oldest production.

In the meantime, Wilcox production was found in four other fields widely scattered over Zapata County where the pay has been at much shallower depths than on the immediate Lopeno deep trend. These are at Roleta, northwest of Lopeno field; Zapata; and at Trevino and La Perla fields, in the northwest part of the county.

In Webb County, Wilcox sands have proved productive in 11 fields. First production was at Retamia, discovered by Phillips Petroleum Co. and Texas Gulf Production Co. in 1944. There, three wells have been completed with gas-condensate production from two pays, 4,900 and 5,200 ft. Deepest Wilcox production so far in this county has been in the Adami area, in the northeast corner. This area, an old shallow-sand field, is productive of oil in the Wilcox at depths of 4,900 to 5,200 ft., and gas-condensate in the deeper sands at 6,500 to 7,500 ft.

Adami has been one of the most actively developed of any of the Wilcox fields so far found in either Webb or Zapata County. Discovered (Wilcox production) late in 1958, it now has upwards of 15 wells to its credit. Its discovery precipitated a more intensified exploration of the Wilcox southward along the play through Webb County. Adami has had more than 45 wells from its shallower (950-1,000-ft.) Jackson-Mirando sands, discovered in 1939.

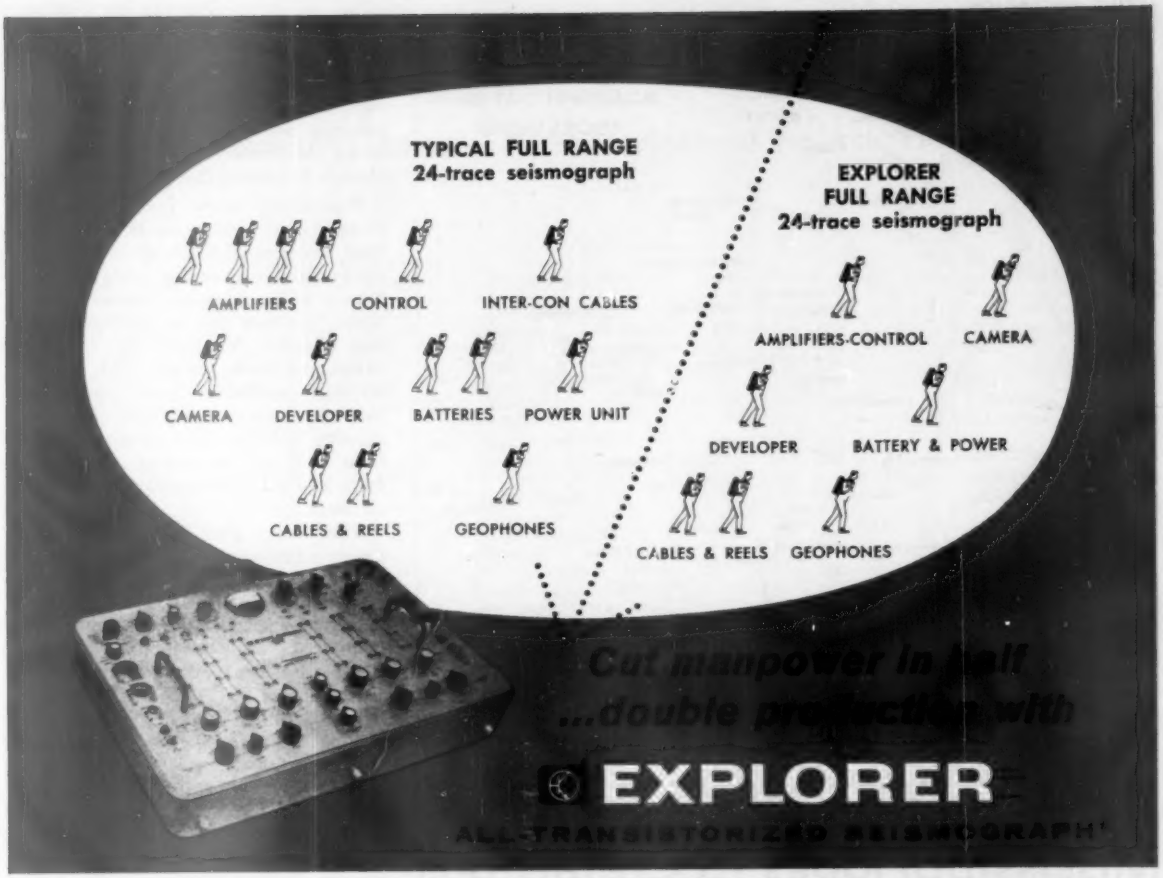
Among the more significant Wilcox discoveries in Webb County has been that on the giant Pescadito dome, northeast of Laredo. Proving of the structure as a salt dome in 1957 extending known limits of the large Southwest Texas salt basin more than 75 miles westward. The size of the dome, more than 7 miles long and 4 miles wide at places, opens the way for a possible large-scale exploration and development program. Three Wilcox gas wells have been completed, one 4 miles south of the other two on the west side of the dome.

The wide extent of potential Wilcox exploration in Webb County is indicated by a gas discovery, just a year ago, in that formation in the remote far-north part of the county. The discovery, by Sutton Producing Co. at Tom Walsh, is nearly 30 miles from the nearest Wilcox production. Nearest other production is a lone Edwards gas well 5 miles southwest. Sutton's discovery well, located on the southwestward extension of the "Deep" Edwards trend play, was drilled to the Edwards at total depth of 10,327 ft. Unproductive in that horizon, it was plugged back to the Wilcox pay at 4,200 ft.

The Nicholson area, one of Webb County's older Wilcox fields, has been in the news lately with an ultradeep exploratory well west of production. There, Hunt Oil Co. drilled its 1 Walker to total depth of 20,603 ft. for a look at the Edwards formation. It set a new drilling-depth record for South Texas, but failed to find production at that depth. Since, it has been testing the Wilcox for a possible extension of Nicholson's 5,550 to 6,050-ft. pays. Nicholson, discovered by Humble Oil & Refining Co. in 1947, has one gas and two oil wells.

Wilcox Fields of Jim Hogg, Webb, and Zapata Counties, Tex.

Field	Discovery company	Disc. year	Prod. depths (ft.)	Type prod.	No. prod. well
JIM HOGG COUNTY					
N. E. Thompsonville	Austral Oil Expl. Co.	1959	9,510- 9,563	Gas-Cond.	2
WEBB COUNTY					
Retamia	Phillips-Texas Gulf	1944	4,946- 5,236	Gas Cond.	3
Hirsch	Sun Oil Co.	1946	6,905- 6,931	Gas-Cond.	1
Nicholson	Humble Oil & Refining	1947	5,556- 5,559	Gas	1
			5,574- 5,577	Oil	2
Maguellitos	Seaboard Oil Co.	1950	6,441- 6,510	Gas-Cond.	4
Aguilares	Skelly Oil Co.	1953	6,460- 6,755	Oil	5
			6,125- 6,290	Gas-Cond.	6
			6,886- 6,918	Gas-Cond.	
Reiser	Killam & Hurd	1954	5,093- 5,128	Gas-Cond.	3
Cabezon	Texaco	1955	6,010- 6,081	Gas	3
Glen Martin	Glen Martin	1958	5,835- 6,100	Gas-Cond.	4
Pescadito	Ginther-Warren-Ginther	1958	5,994- 7,047	Gas-Cond.	3
Adami	General Crude Oil Co.	1958	5,152- 5,190	Oil	7
			6,525- 7,500	Gas-Cond.	6
Tom Walsh	Sutton Prod. Co.	1959	5,208- 4,214	Gas	1
Unnamed	Skelly Oil Co.	1959	4,914- 4,920	Oil	1
ZAPATA COUNTY					
Cinco De Mayo	W. B. Jayred	1949	2,272- 2,310	Gas	1
Lopeno	Standard of Texas	1952	7,300- 9,800	Gas	7
Zapata	Alaska Steamship	1954	3,760- 4,720	Gas	3
Roleta	Stanolind Oil & Gas	1955	7,483- 7,506	Gas	1
Trevino	Texaco	1956	7,641- 7,654	Gas-Cond.	1
S.E. Lopeno	Gulf Resources	1958	8,510- 8,580	Gas	1
			8,803- 8,806	Gas	1
LaPerla	Breuer & Curran	1958	4,624- 4,996	Gas-Cond.	2
Bustamente	Gulf Resources	1958	9,436- 9,466	Gas	1
Herlinda Vela	Katz Oil Co.	1959	10,445-10,460	Gas-Cond.	1
N.E. Lopeno	Jonnell Gas Co.	1959	7,796- 8,100	Gas	2
	Crescent Oil & Gas Co.	1960	11,192-11,208	Gas	1
Taquachie Creek	Atlantic Refining Co.	1959	9,253- 9,254	Gas-Cond.	1
Unnamed	Frankfort Oil Co.	1959	7,940- 7,950	Gas-Cond.	1



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Mississippi looks to Cretaceous and beyond for deep oil

ONE OF the country's most consistently active and prolonged drilling plays is that which has been and still is going on in exploration and development of South Mississippi's deeper horizons.

Still mainly directed at the multiple-horizon Lower Cretaceous section, it has been feeling ahead in a steady buildup of drilling toward the next-lower and intriguing Jurassic beds.

Within the past 2 years this play has been augmented by rejuvenation of exploration of the geologically shallower Tuscaloosa sands of Upper Cretaceous age.

The new interest in Tuscaloosa sands, a primary and generally the ultimate objective in earlier Mississippi drilling, was inspired to a large extent by discovery of Little Creek field early in 1958.

Little Creek, stretching across the Lincoln-Pike county line on the southwest side of the Mississippi salt basin, was the state's first important Upper Cretaceous discovery in several years. Prior to its discovery, interest in further exploration of Tuscaloosa sands as a primary objective had waned. After a long period of wide exploitation and discovery of nearly 50 fields, prospective areas for additional Tuscaloosa drilling progressively played out, and exploration reached successively deeper and wide to lower geologic objectives.

Productive from sands at depths below 10,700 ft., Little Creek has proved one of the state's most expansive and prolific fields. An intensive and active development program extending 1958 and much of 1959 has resulted in the completion of more than 140 wells.

Nearly a half dozen additional Tuscaloosa fields have been found in the revived play that has followed Little Creek's discovery. Most of these are in the same general area, centered in Lincoln, Pike, and adjoining counties on the southwest side of the Mississippi salt basin, where production is at depths below 10,000 ft. Chief of these is McComb field, in western Pike County less than 8 miles southwest of Little Creek. Although apparently not quite as good as Little Creek, McComb, opened last August, already has more than 50 wells.

Production below the widely explored Upper Cretaceous horizons has been found in 35 fields of South Mississippi and one in the eastward extension of the basin at Citronelle, just across the state line in northern Mobile County, Alabama. Of the 35 Mississippi fields, 15 are fields which also have production from Upper Cretaceous or younger horizons. The remaining 22 fields and Alabama's Citronelle field are productive exclusively from Lower Cretaceous and/or Jurassic beds.

The deeper play not only follows trends stretching along the northern and southern rims of the basin but reaches into the basin where a number of known and indicated salt domes remain to be explored and developed.

Pre-Tuscaloosa production in Mississippi dates to 1946 when Humble Oil & Refining Co. completed a gas well at Hub, in Marion County, in the Dantzler zone of the Washita-Fredericksburg horizon at a depth of 10,100 ft. This well has been shut in since completion, and the only other production there has been a recently completed Tuscaloosa gas well.

Chief among the pre-Tuscaloosa fields so far have been Soso, in Mississippi, and Citronelle, in Alabama. Soso, discovered in 1953 and stretching across parts of three counties, now has more than 120 wells. Production has been established through the whole Lower Cretaceous column, and into the underlying Cotton Valley formation of Jurassic age, with depths ranging from 10,000 ft. to below 15,240 ft. on the Cotton Valley.

Citronelle, discovered in 1955, now has nearly 230 wells but so far has been productive only from Rodessa sands at depths of 10,800 to 11,000 ft.

So far, the Jurassic has been found productive in only five fields. In two of these, the discovery well was short lived and no additional wells have been drilled to that horizon.

Although Jurassic production in Mississippi dates to a gas discovery at Tinsley in 1951, it has been only within the past 2 years that there has been any general move to carry exploratory drilling below the Lower Cretaceous section. Now nearly all wildcats in favorable locations are being started with Jurassic objectives, and new drilling in existing shallower fields is being taken to those horizons.

Currently, the only production from

South Mississippi Lower Cretaceous-Jurassic Fields

Field and County	Discovery year	Discovery company*	Producing formation	Prod. depths (ft.)	Type prod.	Prod. wells comp.*	Other pays
Hub, Marion	1946	Humble	Washita-Fredericksburg§	10,098-10,106	Gas	2	Eutaw-Tuscaloosa
Cranfield, Adams-Franklin	1946	California	Paluxy	11,772-11,094	Gas	1	Wilcox-Tuscaloosa
Ovett, Jones	1948	Gulf	Paluxy-Mooringsport	12,011-12,688	Oil	..	Eutaw
			Glen Rose	12,880-13,082	Oil	†1	
Pickens, Yazoo	1950	Carter	Travis Peak	7,728- 7,037	Oil	‡1	Eutaw
Virlillia, Madison	1951	Continental	Hosston	10,550-10,680	Oil	†2	
Tinsley, Yazoo	1951	Union	Smackover	14,019-14,042	Gas	‡1	Selma-Eutaw-Tuscaloosa
Chaparral, Wayne	1952	Gulf	Glen Rose	8,988- 9,516	Oil	11	Eutaw
Baxterville, Lamar	1952	Gulf	Washita-Fredericksburg	10,821-10,041	Oil	‡1	Eutaw-Tuscaloosa
Soso, Jasper-Jones-Smith	1953	Gulf	Paluxy	9,900- 9,960	Gas-Oil	118	Eutaw-Tuscaloosa
			Mooringsport	10,914	Oil	..	
			Rodessa	11,350-11,800	Oil	..	
			Sligo (Bailey)	11,950-12,135	Oil	..	
			Hosston	12,598-12,617	Oil	..	
			Cotton Valley	15,247-15,056	Oil	..	
Bolton, Hinds	1954	Larco	Washita-Fredericksburg	8,350- 8,400	Oil	46	
			Paluxy	9,900- 9,960	Oil	..	
			Mooringsport	10,175-10,550	Oil	..	
			Rodessa	10,400-10,650	Oil	..	
			Sligo	11,350-11,550	Oil	..	
			Hosston	11,400-11,550	Oil	..	
Loring, Madison	1954	Carter	Smackover	12,100-12,400	Gas-Cond.	2	
Pistol Ridge, Pearl River-Forrest	1955	Southern Prod.	Washita-Fredericksburg§	9,000-10,500	Gas-Cond.	14	Wilcox-Eutaw-Tuscaloosa
			Paluxy	11,500	Oil	..	
Ansley, Hancock	1955	M. R. Young	Washita-Fredericksburg	10,787-10,851	Gas-Cond.	5	
Citronelle, Mobile (Ala.)	1955	Zack Brooks	Rodessa	10,870-11,000	Oil	230	
Taylorsville, Smith	1956	California	Rodessa	11,503-11,514	Oil	†1	
West Pistol Ridge, Pearl River	1956	David Crow	Washita-Fredericksburg	9,970-10,110	Gas	3	
			Paluxy	10,955-10,965			
Valley Park, Issaquena-Sharkey	1956	Amerada	Mooringsport	6,238- 6,272	Oil	2	
			Rodessa	6,136- 6,205	Oil	1	
Raleigh, Smith	1957	California	Sligo	6,292- 6,703	Oil	50	
			Hosston	12,084-12,775	Oil	..	
Martinville, Simpson	1957	Central	Mooringsport	11,661-11,681	Oil	17	
			Rodessa	11,690-11,900	Oil	..	
			Sligo	12,395-12,550	Oil	..	
			Hosston	13,080-13,460	Oil	..	
Gitano, Jones	1957	Gulf	Paluxy	11,280-11,286	Oil	1	
Diamond, Wayne	1957	Larco-Durbin	Rodessa	9,200-10,000	Oil	28	
			Hosston	10,000-10,860	Oil	..	
Dexter, Walthall-Marion	1957	Skelly-Kin Ark	Dantzler	11,071-11,079	Gas-Cond.	1	Tuscaloosa
			Paluxy	13,516-13,556	Gas-Cond.	2	
Eucutta, Wayne	1957	Gulf	Paluxy	8,053- 8,069	Oil	11	Eutaw
			Rodessa	9,652- 9,816	Oil	..	
			Hosston	10,900-11,162	Oil	..	
Gwinville, Jefferson Davis	1958	Gulf	Paluxy	11,086-11,100	Gas-Cond.	1	Selma-Eutaw-Tuscaloosa
			Rodessa	13,200-13,590	Gas-Cond.	3	
Boykin Church, Smith	1958	Larco	Rodessa	10,969-10,972	Oil	1	
			Hosston	11,628-11,630	Oil	1	
Reedy Creek, Jones	1958	Larco	Washita-Fredericksburg	9,160- 9,343	Oil	6	Tuscaloosa
			Mooringsport	11,096-11,166	Oil	..	
Bryan, Jones	1958	Central	Rodessa	10,240-10,312	Oil	42	
			Sligo	10,626-10,833	Oil	..	
			Hosston	11,572-11,632	Oil	..	
Sandy Hook, Marion	1958	Humble	Paluxy	10,922-11,744	Gas-Cond.	4	Tuscaloosa
Magee, Smith	1958	Arkansas Fuel	Sligo	13,025-13,057	Oil	12	
			Hosston	13,550-13,800	Oil	..	
Laurel, Jones	1959	Central	Paluxy	11,258-11,269	Oil	1	
Merit, Simpson	1959	Jett Drilling	Paluxy	11,948-12,196	Oil	6	
			Mooringsport	12,710-12,752	Gas-Cond.	..	
			Rodessa	13,028-13,042	Oil	..	
West Heidelberg, Jasper	1959	Gulf	Rodessa	8,967- 8,970	Oil	3	Eutaw-Tuscaloosa
			Cotton Valley	11,238-11,248	Oil	..	
Forkville, Scott	1959	California	Smackover	13,305-13,468	Oil	†1	
Grange, Jefferson Davis	1959	Pan Am.	Mooringsport	13,264-13,270	Gas-Cond.	1	
Kiln, Hancock	1959	M. R. Young	Washita-Fredericksburg	10,286-10,288	Oil	1	
Southeast Chaparral, Wayne	1960	Lyle Cashion	Rodessa	8,752- 8,757	Oil	1	

*Lower Cretaceous-Jurassic reservoirs only. †Discovery well plugged back and recompleted in Eutaw sand. ‡Abandoned. §Includes Dantzler.

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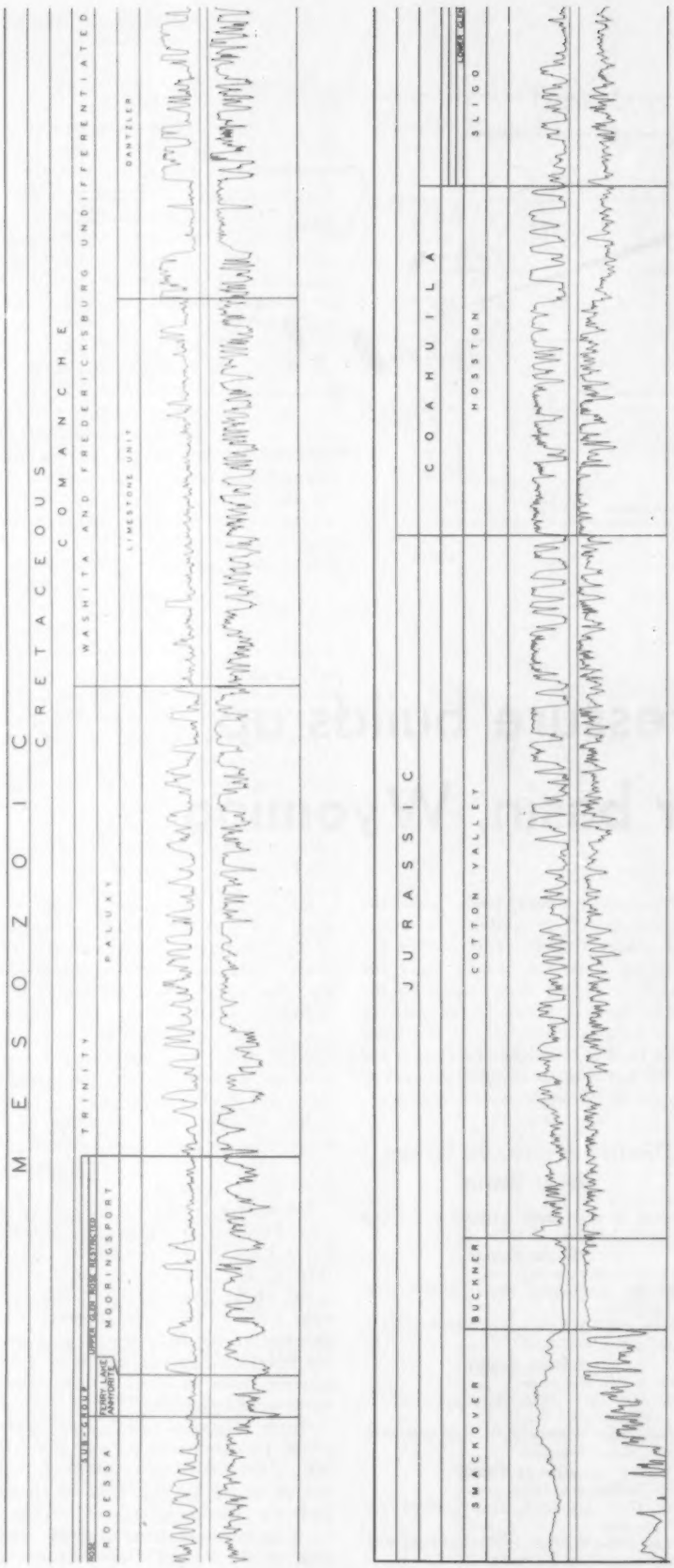


ACTIVE OIL FRONTS

the Jurassic's deeper Smackover horizon is at Loring, in northern Madison County. There, Humble Oil & Refining Co. (Carter division) has two gas-condensate wells, the first was completed in 1954 and the second the following year. Producing depth is from 12,133 to 12,494 ft. Gas has a high hydrogen sulfide and CO_2 content, but problems in its production have been overcome.

Tinsley's lone Jurassic well also was in the Smackover horizon but it produced only a short time and since has been abandoned. The only other Smackover production has been at Forkville, in Scott County, where The California Co. tested some oil in a wildcat drilled in 1959. The well, placed on the pump, with pay at 13,305-13,468 ft. produced only briefly, making mostly water. It never was considered commercial.

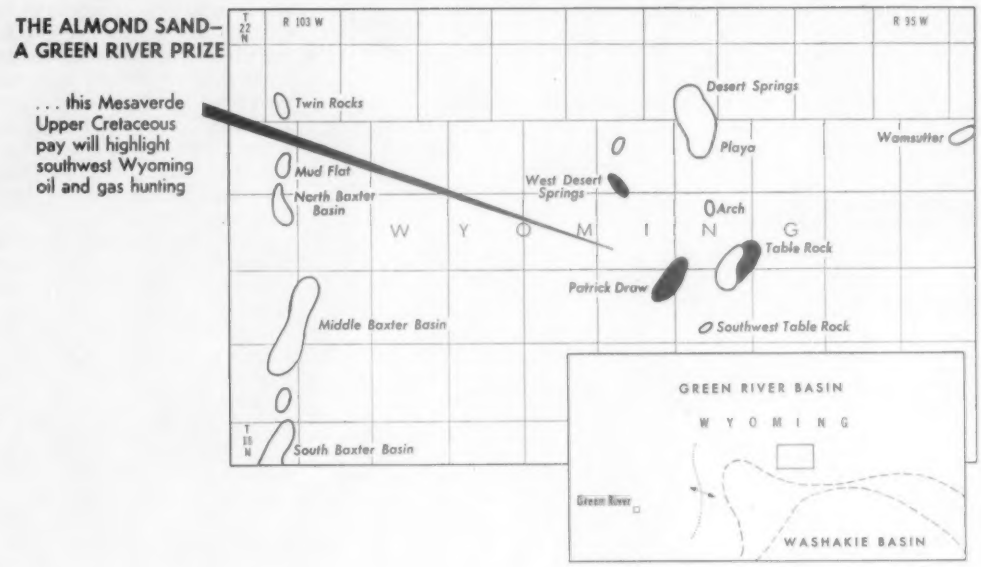
The shallower Cotton Valley member of the Jurassic carries oil in the two fields in which it has been found productive so far. At Soso, the discovery well, completed in 1958, has the pay at 15,247-56 ft. It was dually completed in this zone and also as the field's discovery well in the Lower Cretaceous-Hosston formation at 12,598-12,617 ft. Another well has been drilled since then to the Cotton Valley, and is potentially productive there, but has been completed only in the Hosston pay.

West Heidelberg, in Jasper County, is the other field in which Cotton Valley has been found productive. Two wells have been completed, the first in April 1959, following the Soso discovery. Pay there is at 11,000 ft. Discovery well also was dually completed as the field's initial Lower Cretaceous-Glen Rose producer.

A new addition to the list of Lower Cretaceous fields now is in the making in northeastern Wayne County. There, a wildcat drilled by Lyle Cashion Co., Larco Drilling Co., and others flowed 33°-gravity oil while testing an 8,750-ft. Rodessa sand. It is 3 miles southeast of Chaparral field and 4 miles north of Diamond field, both of which also are productive from Rodessa sands.

There now are more than 70 active drilling operations in the state with depth objectives to Lower Cretaceous and Jurassic sands. Of these more than 25 are on wildcat locations.

COMPOSITE Mesozoic log of South Mississippi and South Alabama showing section from Dantzler to Smackover. Log from "Mesozoic-Paleozoic Producing Areas of Mississippi and Alabama," Mississippi Geological Society, Jackson.



Exploration pressure builds up in Green River basin, Wyoming

THERE'S more than one reason why Wyoming went back into the lead in total drilling and in exploration among Rocky Mountain States last year . . . and why it promises to maintain that position in 1960. One of the best of the several reasons is the Green River basin area . . . or more properly, the whole southwestern portion of the state.

There's been exploration pressure on this area for several years. It began with the gas prospects along the western side of the basin and the development of gas in the old Big Piney-LaBarge-Hogback area in connection with the building of the Pacific Northwest Pipeline.

Until 1958, most Green River basin production was concentrated in extreme western Wyoming and along a line northward through the Baxter basin area and Rock Springs, with other fields scattered along the Colorado border to the south.

These general areas got the first attention, but exploration broke away from them a couple of years ago, and began to concern itself with exploration to the Upper Cretaceous Mesaverde formations over a wide area.

Sweetwater County leads. Today the biggest center of activity is within Sweetwater County. This doesn't pin anything down too closely, since the county is bigger than several of the states. More specifically, an area of about 12 townships including old Table Rock field at its southeast corner is one of the hotter areas of the state, and of the entire Rocky Mountain region.

Discovery data on Green River Basin

Over-all success ratio: wildcats 27%, field wells 80%.

Lincoln County

1959: Two new pools.
1960: No discoveries, two field-well completions.
Success ratio: Wildcats 30%, field wells 72%.
Three active locations.

Sublette County

1959: Seven new fields.
1960: One new field, fourteen field-well completions.
Success ratio: Wildcats 35%, field wells 84%.
Twelve active locations.

Sweetwater County

1959: Twelve new fields.
1960: Three new fields, nine field-well completions.
Success ratio: Wildcats 19%, field wells 40%.
Thirty-one active locations.

Exploration during the past several years has been successful over much of the basin, and in the majority of cases, Mesaverde successes produced gas. This was in line with thinking and objectives in the basin, and indeed was the basis on which the area was opened. Once outlet for gas was assured, exploration in the Green River got briskly under way.

But 1959 brought something of a surprise in the form of substantial oil discoveries at Patrick Draw and at West Desert Springs.

Oil arrives. When El Paso Natural Gas Products completed 1 Patrick Draw Unit, SE SW 1-18n-99w, for a flow of 637 bbl. of oil per day on ¼-in. choke from 22 ft. of Almond sand 5,172-98 ft. it was apparent that this was an oil discovery of a caliber not heretofore known as far as Cretaceous rocks in sonthwestern Wyoming were concerned.

Texas National Petroleum completed 1 Government-Withers, SW NE NE 32-20n-99w, for a flow of 300 bbl. of oil per day on 18/64-in. choke from the Almond interval 3,556-3,616 ft. This is about 8 miles north and west of the Patrick Draw discovery,

6 miles southwest of Desert Springs where multiple Mesaverde gas pools were opened in 1958.

Further drilling met steadily with similar success as 1959 ended and successful drilling is still in progress.

At the end of March, Gulf Oil Corp. gaged 6½-hour flow of oil at the rate of 53½ bbl. per hour at the north end of Patrick Draw field. This flow was from a notch opposite Almond at 5,019 ft. The formation was sand fractured before test.

While development of oil production grew at Patrick Draw and West Desert Springs, a new oil pool was opened at the southwest end of Table Rock field. In SW SW 10-18n-98w, Emmett Schieck, Casper, and Scimitar Oil Co. completed an 875-bbl. per day oil well from Almond 6,781-6,801 ft. This was 3 miles south of existing oil production and 4 miles east of Patrick Draw.

At Mid-March, five oil producers had been officially completed at Patrick Draw, covering a northeast-southwest trend of about 5 miles. Ten locations were staked or active in the field. One failure had been drilled just southeast of the axis of production.

At West Desert Springs seven oil wells had been completed, and three locations were active.

This does not take into consideration the work in progress or completed at Desert Springs, at Table Rock, or at the 15-million cubic feet per day gas discovery drilled on the Arch Unit by Forest Oil Corp. about midway between Desert Springs and Table Rock.

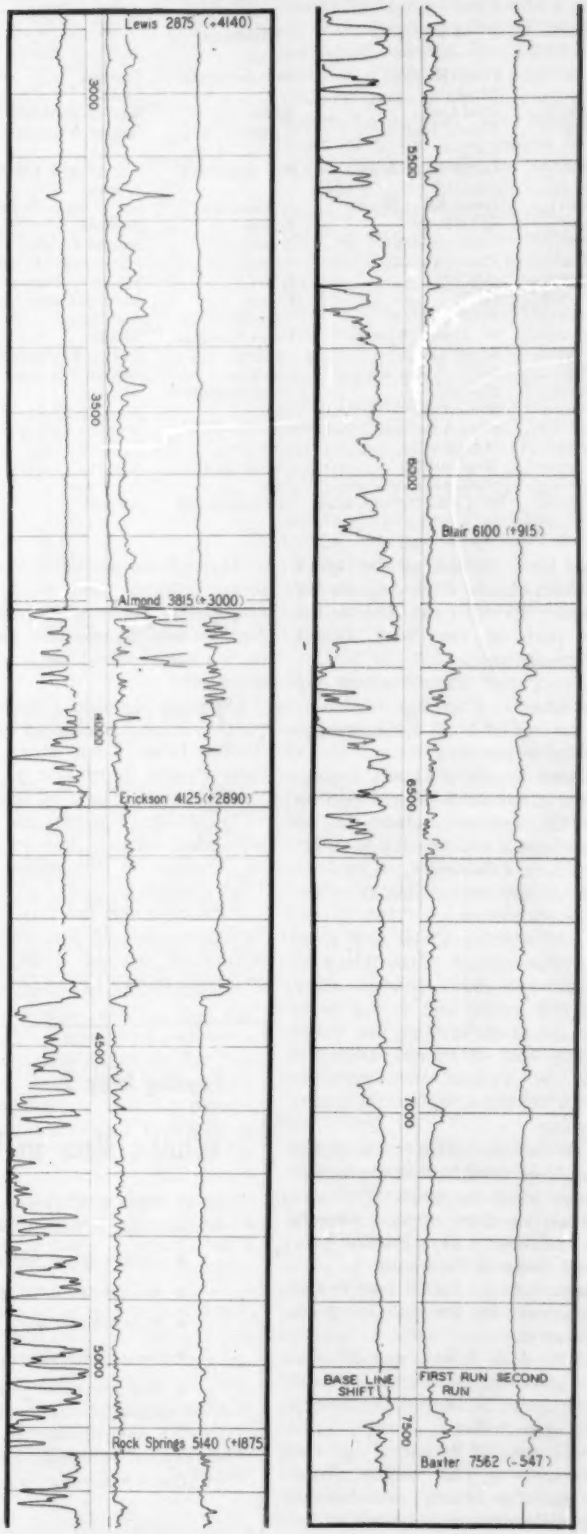
Most of the 12-township area already mentioned as containing the fields under discussion is unitized. These units will give some idea of the potential involved.

Desert Springs. The Desert Springs unit, operated by El Paso and productive of gas—seven producing wells—embraces 28,360 acres, produces from Ericson and Almond, is spaced on a 640-acre pattern. Adjoining it on the southwest is Pubco Petroleum's Playa unit, 22,538 acres. Three producers at the west edge of Desert Springs production lie on this unit, and one oil

DRILLING CONTRACTORS ACTIVE IN THE AREA

Anschutz Oil Co., Inc.
Arapahoe Drilling Co.
Brinkerhoff Drilling Co.
Exploration Drilling Co.
Hewit-Gulick Drilling Co.
Loffland Brothers Co.
R. L. Manning Co.
Noble Drilling Co.
Roden & McRae Drilling Corp.
Signal Drilling Co., Inc.

Type Log for Almond Sand



Green River Discovery Data, 1959 to Date

County	Pool	Company	Pay	Prod. depth	Total depth	Initial production
1. Lincoln	Green River Bend	Pan American	Frontier-Cret.	7,014	7,450	1,435 M.c.f.d. 31 BOPD
2. Lincoln	Opal Unit	Belfer	Second Frontier	10,818	11,013	1,235 M.c.f.d.
3. Sublette	Figure Four Canyon	Carter	Second Frontier	7,626	8,110	2,000 M.c.f.d. 18,000 M.c.f.d. (CAOF)
4. Sublette	Green River Bend	Pan American	Second and Third Frontier	6,795 6,858	7,800	919 M.c.f.d.
5. Sublette	Green River Bluffs	St. Louis Car	Fort Union-Tertiary	5,459	7,347	2,200 M.c.f.d.
6. Sublette	F. LaBarge	Belfer	Frontier		7,358	4,300 M.c.f.d.
7. Sublette	LaBarge area	Belfer	Second Frontier	7,100	7,973	8,100 M.c.f.d.
8. Sublette	Pacific Creek	Reasor	Fort Union (T) Lance (Cret.)		13,313	5,000 M.c.f.d.
9. Sublette	OWWO	Belco	Muddy-Cretaceous	7,697	7,960	2,050 M.c.f.d.
10. Sweetwater	Arch	Forest	Almond-Cret.	5,728	6,202	15,000 M.c.f.d.
11. Sweetwater	Patrick Draw	Texas National	Almond		3,677	300 BOPD
12. Sweetwater	W. Desert Springs	Texas National	Almond	3,818	7,589	9,200 M.c.f.d.
13. Sweetwater	Joyce Creek	Caulkins	Dakota-Cretaceous	4,096	5,055	25 BOPD
14. Sweetwater	Little Worm Creek	Caulkins	Morrison-Jurassic	3,890	4,768	40 BOPD
15. Sweetwater	Pioneer	Mountain Fuel	Almond		7,172	2,530 M.c.f.d.
16. Sweetwater	State Line	Gulf	Wasatch-Tert.	2,710	4,897	9,200 M.c.f.d.
17. Sweetwater	State Line area	Gulf	Wasatch new pay	3,246	3,980	3,000 M.c.f.d.
18. Sweetwater	No name	El Paso	Almond		5,656	637 BOPD
19. Sweetwater	New field	Union Pacific	Almond	3,462	3,702	200 BOPD
20. Sweetwater	State Line new pay	Gulf	Ft. Union	3,934	4,464	450 BOPD
21. Sweetwater	W. Desert Springs area	Texas National	Almond	3,680	4,220	14 BOPD

well has been drilled at the unit's southwestern corner which adjoins the West Desert Springs field. The well is actually part of the West Desert Springs producing area.

The Playa unit fills the entire gap between Desert Springs and West Desert Springs and not a failure has been drilled in this area.

Arch unit. South of Desert Springs and Playa is the Arch Unit. Operator is Forest Oil. The unit includes 22,200 acres. It contains one 15-million cubic-feet per day gas discovery, no failures, and one drilling well which is an intended confirmation.

El Paso's Patrick Draw unit is at the southwest corner of the group of three mentioned above, contains more than 19,800 acres, and is the most active as to current drilling. The Table Rock unit, east of Patrick Draw, is operated by Texaco Inc., contains nearly 12,700 acres, and is the oldest of the group.

Not all the successful work in the area has been done within the actual boundaries of these units. Operators in addition to those named already include Gulf Oil, Union Pacific Railroad, and General Petroleum.

Review. A review of Sweetwater County activity for the past 2¼ years is informative.

In 1958, 8 of Wyoming's 29 discoveries were drilled in the county. During the year, 24 Sweetwater County wildcats were drilled.

In 1959, nine of Wyoming's 40 discoveries were in this county. Total drilling for the county included 50 wildcats, 10 development wells.

Through the middle of March 1960, seven wildcats had been officially completed. Three of these found oil. Nine of ten development completions in this same period were successfully completed.

Outlets. Colorado Interstate Gas pipeline runs through the Desert Springs-Table Rock area. This line joins Pacific Northwest in the Rock Springs area, is part of the proposed "Utah Project" in that the originally scheduled eastward flow of gas would be reversed in connection with the Utah project.

Paralleling this line is a Utah Oil & Refining crude-oil line which comes northward out of Colorado, turns southwest to Salt Lake City.

Current reports indicate that El Paso, in the interest of its Utah Project, has sought gas contracts for fields throughout southwestern Wyoming and in the Wind River basin to the north and northeast. While it is known that El Paso has contracted for a great deal of Green River Basin gas, the firm has not yet commented on these current reports. Prices of 18c per M.c.f. are mentioned by the usual reliable sources now giving circulation to the stories mentioned above.

At any rate, current outlet exists. Further work should not be throttled for lack of facilities.

As to the oil market, it's as good for this area as for any other at the moment.

Coming May 2

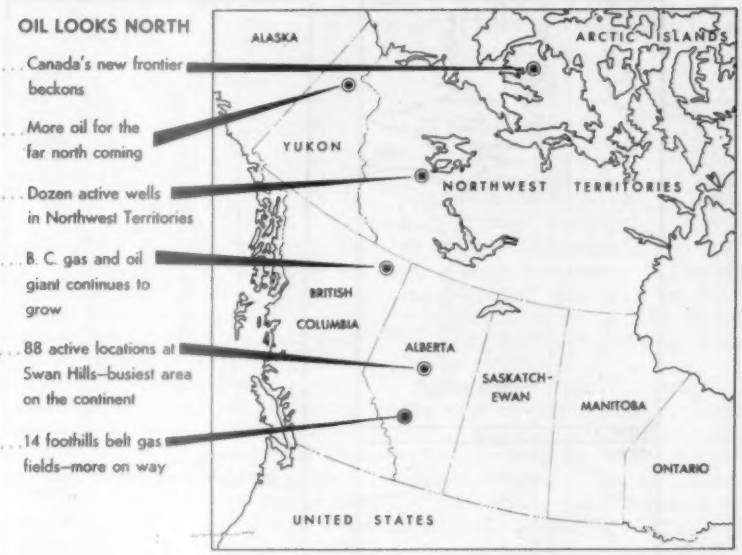
What's New in Field Processing?

NEXT WEEK'S JOURNAL will feature an up-to-date report on the latest happenings in field processing. Watch for:

- Outstanding technical papers from the NGAA annual meeting.
- A look at LPG storage and product transportation.
- Automation and design of plants.
- New construction projects.
- The Journal's newly expanded annual survey of natural-gasoline and cycling plants in the U. S. and Canada.

The new survey lists every plant in both countries, including figures on capacities, throughput, and production of the various types of liquids.

Don't miss next week's report on field processing.


OIL LOOKS NORTH
. . . Canada's new frontier beckons
. . . More oil for the far north coming
. . . Dozen active wells in Northwest Territories
. . . B. C. gas and oil giant continues to grow
. . . 88 active locations at Swan Hills–busiest area on the continent
. . . 14 foothills belt gas fields–more on way
ALASKA
ARCTIC ISLANDS
YUKON
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
UNITED STATES

NORTH OF THE BORDER

Swan Hills hailed as new era in Canada's economy

SWAN HILLS, Alberta, is extremely rich in oil. Just as the famous Leduc Devonian oil discovery of February 1947 is acclaimed as the birthday of Canada's present oil industry, Swan Hills must be accredited with a new era in this most important phase of the Canadian economy.

Three years ago, Home Oil Co., Ltd., and a group of associated companies held data on a subsurface geological study, a seismic reflection survey, and also had a limited knowledge of an oil discovery well—Home et al. Regent 8-11-68-10 Swan Hills on LSD 8 11-68-10w5. Now this same group has a major stake in the huge oil-producing area known as Swan Hills and has in the interim expended many millions of dollars.

Busiest season. Last drilling season, the general Swan Hills region, lying about 120 miles northwest of Edmonton, a region bounded on the south by Township 61, the north by Township 70, and east and west by Ranges 7 and 14, west of the Fifth Meridian, was the most active exploration and development area in all of western Canada. Operations in the region have already been slowed considerably by the imminent spring thaws.

The muskeg and general ground conditions of the region had forced crews from the area after limited sorties each winter season, and prior to Home Oil's discovery in 1957, the region was a "Filed and forgotten" exploration area.

At the height of the most recent drilling season over 400 men were employed in the area by the oil industry. At least 50 rotary drilling rigs engaged in drilling new field and wildcat wells to better establish the full potential of the region. Swan Hills field proper, that is defined by the Oil and Gas Conservation Board as an area of 44,000 acres contained in Townships 66, 67, and 68, Ranges 10 and 11w5, is estimated to contain over 1.3 billion barrels of reserves in place and on primary recovery over a third of a billion barrels of crude are estimated as recoverable.

As of the end of mid-March 1960, Swan Hills field itself boasted 130 oil-well completions with no dry holes. Added to Swan Hills field, as presently defined, but still within the Swan Hills oil producing region, are about 50 other producers, in the Judy Creek, Sarah Lake, and Virginia Hills sectors of the region.

Companies at work. Home Oil Co., Ltd., remains as the major operator in Swan Hills field proper, but in other regions, the majors have followed the Home team's lead and come up with significant discoveries and resulting oil reserves. Pan American Petroleum Corp.-British American Oil Co. Ltd. team is the large operator at Sarah Lake, that lies immediately south of Swan Hills proper and Imperial Oil Ltd. with its major strike at Judy Creek, 25 miles south of the original Swan Hills field discovery, is the 'big' operator in that region.

Companies with oil completions in the general area include (well completions to mid-March are shown in parentheses):

Operators: Home Oil Co., Ltd., (58); Pan American Petroleum Corp. (45); Imperial Oil Ltd. (20); British American Oil Co., Ltd. (14); Mobil Oil of Canada, Ltd. (11); Hudson's Bay Oil & Gas Co., Ltd. (9); Shell Oil Co. of Canada, Ltd. (6); McMahon & Associates (5); Sinclair Canada Oil Co. (5); Bailey Selburn Oil & Gas, Ltd. (4); Canadian Kewanee, Ltd. (3); Texaco Canada Ltd. (3); Schermerhorn Oil Corp. (2); Plymouth Oil Co. (1).

Home Oil Co. operates on behalf of itself, the French Petroleum Co. of Canada, Ltd.; Kern County Land Co.; Alminex, Ltd.; United Oils, Ltd.; and Texaco Canada Ltd. on one spread of acreage; for Alminex, United and Texaco Canada on another; and Fargo and General American Petroleum Corp. on still another. Pan American and British American's wells are jointly owned in the field area with Pan Am operating in one specific field sector and British American in the other. Shell is a participant with Home, Alminex, Hudson's Bay, Union Oil Co. of California, and United Oils in one block of lease at Virginia Hills, while Hudson's Bay operates a number of wells at Virginia Hills for the group of Home, Union, Alminex, and United.

Acreage. As Swan Hills was a remote unsettled region, the Alberta government held all petroleum and natural-gas rights in the area. In the Swan Hills discovery area Townships 61 to 68 Ranges 7 to 13w5, were set aside by the Alberta government as a petroleum reserve, and as such the original P&NG Reservations contained therein were sold at cash bonus sales for considerable monies. Being government reservations, the exploration companies were allowed to explore for oil and/or gas and after making a discovery were allowed a specific time limited to make selection of lands from the Reservation.

The selection could not exceed 50 per cent of the original acreage and had to be selected on a set pattern.

The lease selection of the discovery and development firms has resulted in Crown Lands, which have been proved or semi proved by development and now the Crown is reaping a second harvest on its endowed rights through its Crown Reserve Cash bonus sales. Rentals on all rights in the area will supply additional revenue, and royalties on production will continue throughout the producing life of the properties.

Better than $76.5 millions have been poured into the coffers of the Alberta government from its P&NG Reservation and Lease sales in this area and another pay day is scheduled for April 21, when the second Alberta Crown Sale of 1960 will be conducted. Thirteen proven half-section tracts are offered by the Crown at this forthcoming sale, as well as five full section parcels that are in close proximity to oil completions.

Town built. Last summer a town, modern by any oil-industry standards, was established at Swan Hills (Section 14-66-10w5) and more orderly development was incorporated. All-weather roads, an unheard-of luxury to the supply firms that attempted to keep rigs operating during initial development years, have also been constructed into the area. But the term "all-weather" is mere mockery during

Swan Hills Drilling Data

Pay: Beaverhill Lake (Mid-Devonian), 8,400 ft.
Approx. cost of well: Flowing $175,000. Dry hole $125,000.

Cost averages: Footage price $5.50
Day: With pipe $1,050; without pipe $1,000

Normal Rig Time Distribution

% on ft. rate	85	Total days	38
% on day rate	15	Total bits	30

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	600	600
Oil string	5½	8,400	*400

*Around shoe—used staging collars and cemented 200 ft. above second Specks.

Typical Mud Program

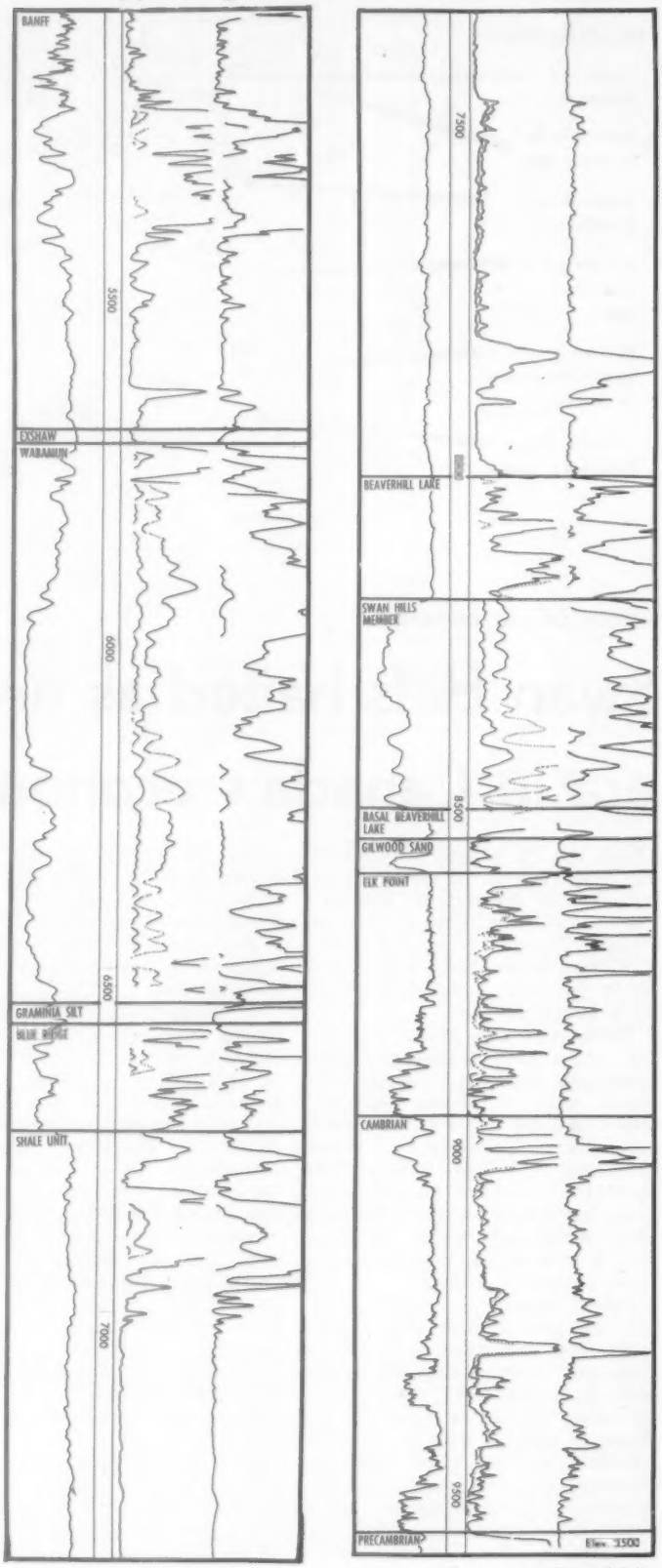
Water gel emulsion mud below 5% by volume with oil or diesel-base mud.
Serious shale sluff; experimenting with shale-resistant mud.

Average Formation Tops

Second Specks	3,200
Blairmore	4,016
Wabamun	5,600
Beaverhill Lake	7,900
Swan Hills member of Beaverhill Lake	8,050

Note: These wells have 10-155 ft. of net pay in reef.

Type Log Swan Hills Area



Log courtesy Home Oil Co.

Swan Hills Area Field Data

Field	Oil wells	Pay zone	Avg. depth	Oil prod. 1959 bbl.	Gas prod. 1959 M.c.f.	Gravity	Average wellhead price/bbl.
Swan Hills	85	M. Dev.-Beaverhill Lake	8,229	1,717,093	839,743	41°	$2.11
Virginia Hills	3	M. Dev.-Beaverhill Lake	9,212	57,984	23,646	37°-39°	$1.88
Judy Creek	26	M. Dev.-Beaverhill Lake	8,500	126,762	74,034	42°-43°	$1.72
Morse River	3	M. Dev.-Beaverhill Lake	8,220	.....	.....	.....	.....
Carson Creek	4	M. Dev.-Beaverhill Lake	8,406	22,532	18,131	41°	$1.91

spring thaw and for that reason it will be quite quiet at Swan Hills for the next number of weeks.

Road bans are enforced more strongly by the oil firms themselves in such regions as Swan Hills in the spring, for they are extremely costly installations that sink out of site into the muskeg under heavy vehicular traffic when "King Mud" takes over the Canadian oil patch about April of each year. Home Oil estimated its expenditures on a road grid system at well over a million dollars as of October 1, 1959, and has since spent additional sums on its growing system.

The Alberta government has plowed back well over 2 million dollars of its revenue from Swan Hills into a high-quality road from Fort Assiniboine—the previous northwestern terminus of its road system into the Swan Hills wilderness and a point about 75 miles northwest of Edmonton.

Supply. Swan Hills development was one of the major reasons that supply houses implemented a delivery charge in Canada, for the 250 to 350-mile delivery from the main sources of supply at Edmonton was proved a very costly operation in early exploration and development. Roads were so rough in early stages that an auxiliary driver had to go along on all deliveries for fear of crackups and imminent dangers of the long haul by a single driver.

Pipeline. Pipeline facilities, built at an initial cost of $8.5 million serve the main development of Swan Hills field, and spur lines have been completed to the Sarah Lake, Judy Creek, and Virginia Hills producing areas. A further extension to the recently discovered Carson Creek region in Township 61, Range 12w5, 12 miles southwest of Judy Creek, is now under construction. Another link in this delivery system is being laid to the Deer Mountain sector of the Swan Hills region, 15 miles northwest of Swan Hills townsite. Pipeline facilities are operated by Home Oil Co. and feed the area's crude into Edmonton for delivery to market in either eastern or western Canada, or the midwestern or western sections of the United States.

Production allowables. April 1960 per well allowable was 85 bbl. daily, with a pool allowable of 11,590 bbl. each 24 hours. And when the field's wells are rated with an MPR of 230 bbl. daily, the 85 bbl. allowed is just 37% of potential.

Drilling data. Swan Hills field was discovered by the drilling of Home et al. Regent 8-11 Swan Hills in LSD 8-11-68-10w5, in the spring of 1957. Home was operator of the exploratory team which included: Home; Alminex, Ltd.; United Oils, Ltd.; Geoil, Ltd., (now included in Alminex) and Regent Refining (Canada) Ltd. (now included in Texaco Canada Ltd.).

Completion depth was 8,988 ft. in the Precambrian. The well was rated with an initial production of 494 bbl. daily through a 22/64-in. choke from the perforated interval 7,845 to 7,872 and 7,878 to 7,912 ft.

The producing horizon in the area is termed the Swan Hills formation-Beaverhill Lake group of the Upper Devonian. Maximum reservoir thickness established to date in the region is 395 ft. and average is just over 100 ft.

Development is being carried out on a 160-acre basis in the main development sectors and applications are pending for 320-acre spacing in the eastern sector of the producing area. Wells that cost on the average of $50,000 to drill and complete are usually cased from 600 to 1,200 ft. Average completion depth 8,300 ft. String of 5½-in. casing is then usually run through the main Swan Hills formation development into the base of the zone allowing for selective perforating of the oil pay section. Crude recovered is 39.5° API, with a sulfur content of near 0.20%. Initial solution-gas-oil ratio approximates 500 cu. ft. per bbl. Although there has been some indication of water at a number of wells, it is not yet known if this is an effective drive mechanism.

NORTH OF THE BORDER

British Columbia emerging as gas and oil giant

BRITISH COLUMBIA is the second-largest natural-gas-producing area in Canada. With each drilling season, its natural-gas potential moves ahead by leaps and bounds and reserves of crude oil are added. This past winter was no exception. Natural-gas reserves in the current hot spot—the Fort Nelson district—right in the northeastern corner of the province, were increased 10-fold and now stand at near 2.5 trillion cubic feet. Oil reserves were definitely added as new strikes in the general Fort St. John region, some 200 miles south of Fort Nelson, were made.

Limited season. Exploration in this virtually untested region of Canada is unfortunately limited to about 4 months of the year. In British Columbia the operator has almost 8 months to study the previous year's exploration and that in itself could be the major factor which has kept the success ratio in the region so high. In 1959 alone, that ratio, based on 110 completions was 1 dry hole for each 2.3 wells drilled. That trend also carries through to the exploration scene where the success ratio of 60 wildcats was 1 for each 2.5 drilled.

Vast area. The area of the sedimentary basin in northeastern British Columbia consists of 50,700 sq. miles favorable for oil and gas exploration. The density of drilling as of November 1, 1959, was one well to 205 sq. miles of potential gas area. That contrasts to one well for 48 sq. miles in Alberta as of March 31, 1958, when 4,198 wildcat wells had been drilled in 200,000 sq. miles of potential gas lands.

While the success-failure ratio is

Swan Hills Area Field Data

Field	No. of wells gas	No. of wells oil	Pay zone	Avg. depth	Gas prod. 1959 M.c.f.	Oil prod. 1959 bbl.
1. Beatton River	1	4	Triassic-Halfway	6,500	5,192 (sol gas)	5,447
2. Beatton River, West	0	5	Triassic		398 (sol. gas)	1,069
3. Blueberry	8	4	L. Cret.-Cadomin	4,300	2,044,801	4,209
			Triassic-U. Schooler Creek	4,700		
			Miss.-Rundle	6,900	3,017 (sol. gas)	
4. Boundary Lake	2	29	L. Cret.-Bluesky	3,580	488,079 (sol. gas)	688,846
			L. Cret.-M. Gething	3,600		
			L. Cret.-Cadomin	3,850		
			Tri.-U. Schooler Creek	4,000		
			Triassic-Bound. Lake	4,200		
			Tri.-B. Schooler Creek	4,500		
5. E. Blueberry	2	0	Triassic		740,460	
6. W. Blueberry	3	0	Triassic		644,387	
7. W. Buick Creek	12	2	Triassic		13,863,729	
8. Buick Creek	6	2	L. Cret.-Nikanassin	3,700	22,278	
			Tri.-U. Schooler Creek	3,950		
			Tri.-M. Schooler Creek	4,150		
			Tri.-B Schooler Creek	4,700		
9. Fort St. John	27	6	L. Cret.-Gething	3,300	322,410 (sol. gas)	116,945
			L. Cret.-Cadomin	3,400	16,600,215 dry gas	
			Tri.-U. Schooler Creek	4,100		
			Tri.-M. Schooler Creek	4,600		
			Tri.-B. Schooler Creek	5,100		
			Penn-Rocky Mountain	6,400		
			Miss.-Rundle	7,000		
10. Milligan Creek	0	9	Tri.-Halfway	3,705	833,773	44,277
11. Bubbles	8	0	Triassic "A"	4,802	1,152,499	
12. Dawson Creek	4	0	L. Cret.-Cadotte	2,780	820,704	
13. Fort St. John Airport	3	0	Cadotte, Cadomin,	4,950		
			Gething, Triassic	6,320	11,020,214	
14. Fort St. John, S.E.	15	0	Permo-Penn			
15. Gundy Creek	4	0	Tri.-U. Schooler Creek	4,700	1,095,149	
			Tri.-M. Schooler Creek	5,600		
16. Halfway	3	0	Tri.-U. Schooler Creek	3,750	2,715,728	
			Tri.-B. Schooler Creek	5,050		
17. Highway	5	0	L. Cret.-Nikanassin	4,430	2,647,679	
			Tri.-U. Schooler Creek	4,700		
			Miss.-Rundle	6,800		
18. Jedney	10	0	Triassic		707,612	
19. Kiskatinaw	1	0	L. Cret.-Cadomin	4,000		
			Tri.-U&M. Schooler Creek	5,600		
				4,750		
			Devonian		1,813,524	
20. Kobes	9	0	L. Cret.-Cadomin	2,750	7,013,116	
			Tri.-M.&B. Schooler Creek	5,000		
			Penn.-Rocky Mountain	6,600		
			Miss.-Rundle	6,900		
21. Montney	3	0	L. Cret.-Gething	3,650	833,773	
			Tri.-M.&B. Schooler Creek	4,830		
				4,300		
22. Nig Creek	6	0	Tri.-U. Schooler Creek	4,400		
23. Pouce Coupe	2	0	L. Cret.-Cadotte	2,150		
			L. Cret.-Notikewin	2,450		
24. Red Creek	2	0	Tri.-U, M, B. Schooler Creek	4,300		
				5,000	254,145	
				5,300		
25. Sunrise	3	0	L. Cret.-Cadotte	3,100	301,138	
26. Stoddart	2	0	Penn. Rocky Mountain	6,340	5,138,555	
27. Clarke Lake	5	0	Devonian	6,442		
28. Kotcho Lake	3	0	M. Devonian Slave Point	6,770		
29. Petitot River	2	0	M. Devonian Slave Point			
30. Doig River	0	6	Triassic	3,464		
31. Doig River	1	0	Jurassic	3,774		
32. Cameron River	1	0	Triassic			
33. Klua Creek	1	0	Devonian	6,850		
34. Laprise Creek	1	0	Triassic	4,486		
35. Paddy	1	0	Devonian	7,934		
36. Prophet River	1	0	Devonian	6,555		
37. Nelson Forks	1	0	M. Devonian Slave Point	7,434		
38. Big Arrow	0	4	Triassic "D"	3,656		
39. Graham River	1	0	Bluesky, Gething	3,022		
40. Aitken Creek	0	1	Gething	4,385		
41. Fort Nelson	3	0	Devonian Slave Point	6,162		
42. Sikanni-Chief River	3	0	Triassic "A"	4,422		
Total gas production last year			69,959,566 M.c.f.d.			
			Cum. 143,958,018 M.c.f.			
Total oil production last year			866,234 bbl.			
			Cu. 1,872,949 bbl.			

ACTIVE RIGS, LOCATIONS

Swan Hills, Alberta	
Carson Creek	8
Virginia Hills	10
Judy Creek	12
Morse River	1
Sarah Lake	7
Swan Hills proper	50
British Columbia	
Boundary Lake	13
Blueberry River	1
Blueberry	2
Peejay	4
Doig River	2
Jedney	2
Sikanni-Chief River	5
Bubbles	3
Laprise Creek	1
Headstone Creek	1
Muskwa River	1
Trutch	1
Minaker River	1
Beatton River	6
Milligan Creek	3
Kahntah River	1
Fort Nelson	1
Clarke Lake	1
Kledo Creek	1
Nelson Forks	1
Bekani Lake	1
Komie Creek	1
Maxhamish Lake	1
Petitot River	1
Kotcho Lake	3
Beaver River	1
N.W.T. and Arctic	
Trout River	3
Celibeta River	2
Tathlina Lake	2
Alexander Falls	1
Willow Lake	1
Cartridge	1
Lac Tache	1
Eagle Plains	2
Rond Lake	2
Grandview Hills	1

quite remarkable in the province, another aspect also crops up. For each wildcat well drilled to November 1, 1959, 12.28 billion cubic feet of natural gas had been discovered. That is almost twice the rate established in Alberta.

Gas leads. The keynote in exploration in the northeastern sector of British Columbia has always been gas—a complete reversal to the oil first-gas later concept in other areas of western Canada, and for that matter, other parts of the world. There is a predominate factor that has perpetuated that outlook—markets. Following discovery of Fort St. John gas field and related areas, Westcoast Transmission Co. envisaged great things for the area and was rewarded with a permit enabling it to construct pipeline facilities to markets in the Vancouver and the U. S. Pacific Northwest. Therefore, the market for natural gas was available while a market for crude is only now being created.

That oil market outlet will see a pipeline constructed this spring from the pools in the southern sector of the exploration area into the northwestern sector of Alberta—tying into the Peace River Oil Pipeline facilities at Sturgeon Lake and through those facilities to the Trans Mountain Oil Pipeline terminal at Edson, thence into the Vancouver and Puget Sound refining areas.

In the southern part of the northeast corner are included such fields as Fort St. John, Buick Creek, Blueberry, Nig Creek, and the recently discovered Jedney-Bubbles-Laprise Creek Triassic trend. Wells in this district are primarily set up as Triassic-zone evaluations. In the northern half are the Kotcho Lake field that contains three gas wells; Petitot River field that contains two gas wells; and Clarke Lake-Fort Nelson field that contains six producers. This is strictly a Beaverhill Lake-Middle Devonian play.

As of November 1, 1959, the province had 3 trillion, 44 million cubic feet in reserve (including one well in both Kotcho Lake and Petitot River and three at Clarke Lake). The past

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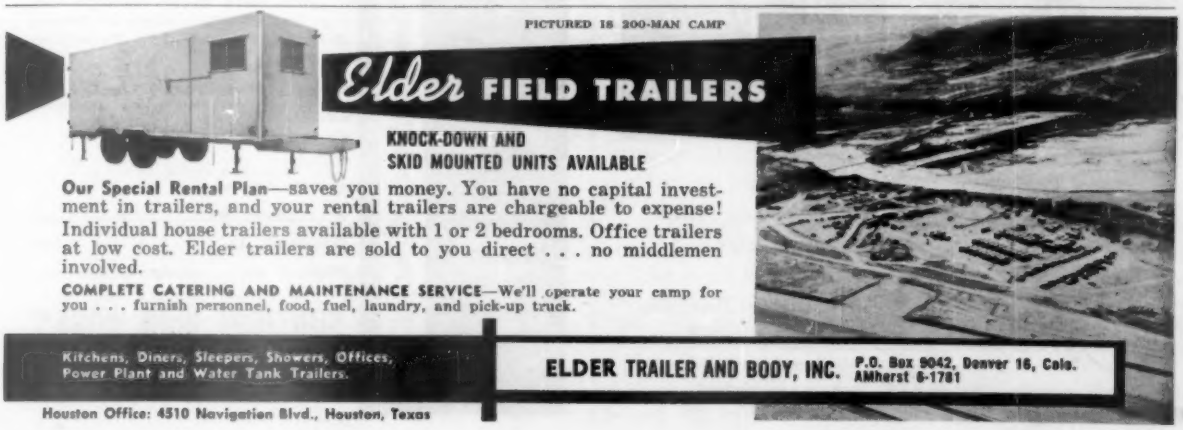

season has seen one more success drilled at Petitot, two at Kotcho, and three at Clarke Lake-Fort Nelson. With those, the reserves in this area alone have jumped from near 500 billion to near 2.3 trillion.

Northing in this northern region is unbelievable. For instance, one venture in the Fort Nelson-Clarke Lake area—which is more or less on the outskirts of Fort Nelson townsite—found over 350 ft. of porous dolomite in the Middle Devonian. So great was the pressure on the well that at completion of drilling the operator was afraid to pull drill string. Instead, he left it in the hole and cemented it in as production casing. Absolute open flow through the 3½-in. drill pipe was calculated at 135,000,000 cu. ft. daily.

The other two are less defined than Clarke Lake field. However, this season's activity produced another highly productive well at Petitot and two more at Kotcho. In addition, two other stepout wells are being drilled in the latter area.

The new producer in the Petitot River district, 70 miles north-northeast of Fort Nelson, rated an absolute open flow of 185,000,000 cu. ft. per day compared to 150,000,000 cu. ft. daily tested from the discovery hole 1¾ miles northwest. At Kotcho, meanwhile, the initial follow-up to the discovery has flowed at rates up to 9,600,000 cu. ft. daily through restricting chokes and the other, 3 miles north, is in the process of completing with absolute flows of up to 100,000,000 cu. ft. per day rumored.

While the Westcoast system extends only midway in the exploration area it is expected that due to the recent discoveries, follow-up successes and field development wells drilled in this northern area another line will be constructed from the main artery south of Fort St. John this year.

B. C. Drilling Data

FORT NELSON AREA

Pay: Mississippian 2,000 ft.; Slave Point (Mid-Devonian) 6,500 ft.

Approx. cost of well: Flowing, Mississippian $50,000; Slave Point $250,000.

Dry hole, Mississippian $45,000; Slave Point $175,000.

Cost averages: Footage price $14.00
Day: with pipe $1,000; without pipe $900.00

Normal Rig-Time Distribution

% on footage rate	66	Total days	60
% on day rate	34	Total bits	45

Casing Program

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	13⅜	300	300
Intermediate	9⅝	1,200-2,000	600
Oil string	7	6,500	300

Typical Mud Program

Gel, sacks	1,500
Starch, sacks	150
CMC, sacks	50
Quebracho, sacks	50
Lignite, sacks	200
Lignosul fonate, sacks	50
Lime, sacks	325
Caustic, sacks	70

Avg. Formation Tops (Drlg. depth, ft.)

Mississippian	2,000
Slave Point (Middle Devonian)	6,500

Other areas. Pan American's Beaver River well is the most northwesterly yet drilled in the northeastern sector of the province. However, since discovery, the well has run into trouble and a fishing job is now in progress. During initial test gas flowed at rate 3,600,000 cu. ft. daily—indicating that another Devonian structure has been uncovered.

British Columbia, while still in its infancy as far as the oil and gas industry is concerned, showed an increase of 10% in its gas production last year and oil production jumped 40%. With the new gas line planned, along with the oil line fast becoming a reality, 1960 could see all previous records broken and a big step forward for the industry in that province.

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Canada's new oil frontier beckons explorers to Arctic Circle

EXPLORATION above the Arctic Circle in Canada's Northwest and Yukon Territories will be paced in 1960 by at least 3 drilling operations and 10 to 12 seismic crews.

The drilling projects, two in the Northwest Territories and one in the Yukon, are slated to explore the huge sedimentary basin bounded generally by the Precambrian basin rocks on the east and the mountains on the west.

Spurring the increased activity in the Canadian Arctic are a number of acreage commitments which operators must start work on or turn back to the government. Currently, more than 100 million acres are held by oil companies in the Yukon and Northwest Territories under acreage commitment deals.

Under this system, an operator is obligated to spend a specified amount per year per acre under contract. The scale increases from a minimum of 5 cents per acre in the first 18 months to 50 cents per acre after 5 years.

Operations in the Canadian Arctic, as far as working conditions are concerned, are on a par with those in remote Alaskan areas. One operator in the Canadian Arctic said that if anything, Canadian operations are a little less expensive.

As in any remote area, transportation and logistics are the big problem in the Yukon and Northwest Territories. Aircraft and river navigation and stockpiling play the dominant role with road building held to a minimum whenever possible. As in Alaska, surface conditions in the Canadian Arctic consist mostly of muskeg-covered permafrost.

Until fairly recently, ground parties had confined their activities to the winter months when frozen earth permitted reasonably free movement. With the development of wide-tracked vehicles designed to traverse thawed areas, year-round seismic and geologic work is expected to pick up.

The three drilling projects slated above the Arctic Circle include:

... **Grandview Hills.** With Richfield Oil Corp. as operator, a group of oil companies were drilling a basement test in the Northwest Territory at a point about 20 miles west of the Mackenzie River and 185 miles south of the Arctic Ocean. At last reports, it was drilling below 5,600 ft.

In a race against a freezing river, the Peter Bawden Drilling Co. rig was moved 1,300 miles from Spirit River, Alta., to the drillsite 45 miles north of the Arctic Circle. The move involved a 550-mile truck trip from Spirit River to Hay River on Great Slave Lake. From there, the rig and equipment were barged 778 miles up the Mackenzie River to Little Chicago 85 miles north of Fort Good Hope. The final 17 miles was made by crawler tractor on an access road built after the freeze had set in.

Richfield, French Petroleum Co. of Canada, Ltd., Clark Oil & Refining Corp., and Hudson's Bay Oil & Gas Co., Ltd., hold an 85% interest in the 3.5-million-acre block in the lower Mackenzie basin. The other 15% is held by Canadian Devonian Petroleums, Ltd. The group plans additional geophysical work in the area this summer.

The nearest production to the huge block is at small Norman Wells field about 185 miles southeast of the Richfield wildcat.

... **Rond Lake.** Five companies, headed by Western Decalta Petroleum, have launched a five-well program in an area of oil seeps in the Northwest Territory 65 miles southeast of Richfield's test. These shallow wells are designed to look at the Devonian expected around 1,500 ft. The first well was slated for a location about 1 mile from the largest seep. Canpet Exploration, Supertest Petroleum Corp., New Continental Oil Co. of Canada, and Glacier Explorers are the others in the deal.

... **Yukon.** Amerada Petroleum Corp. and Ohio Oil Co. had a five-well

wildcat program under way on a 3.5-million-acre holding in the Yukon and Northwest Territories. The big feature of this $8-million program thus far was the 380-mile winter road the two companies built from Elsa to the wellsite 45 miles west of Fort MacPherson in the Yukon. The gravel road was built in just 3 months. The first drillsite was 110 miles south of the Arctic Ocean and 150 miles west of Richfield's Grandview wildcat.

Other problems. In addition to the usual problems confronting an operator in the Arctic, another major problem will pop up as soon as someone makes a commercial discovery—how to move the crude to market?

In general, two theories prevail. One envisions a pipeline from the Arctic oil field to Alaska on the Pacific Ocean. From there, it would be tankered to Washington, California, or Japanese refineries.

The other visionary plan involves the use of huge atomic-powered tanker submarines operating under the frozen Arctic Ocean to European markets.

Obviously, both plans will require a pretty spectacular discovery to be anything approaching economically competitive with other crude-rich areas existing today.

RIG of Peter Bawden Drilling Co. drilling for Richfield Oil Corp. in Canada's Northwest Territories above Arctic Circle.

History of Region

The Northwest-Yukon Territories form one of the largest regions of the world that is virtually untested yet favorably located for oil and gas accumulation. Within the past year two discoveries in the area, widely separated, have indicated that oil men knew what they were doing when they sparked one of the largest land rushes in the history of Canada. Although the two wells in question had nothing to do with the land play it is reasonable to assume that before too many years have passed, further exploration will produce many more significant finds and turn the region into another major gas or oil-producing province.

Exploration in the Northwest Territories started in the early part of this century. Imperial Oil Ltd. fathered the play and was rewarded with oil production in the Norman Wells region in 1920. The play then died, due to many things, principally its distance from market. However, during World War II, further work was done in the area when any known oil deposit was sought when it was felt the Allies were running out of crude supplies. The war ran out before the oil did, however, and once again drilling ceased. While that field is still producing, all the oil from it is refined right on the spot and used within the Northwest Territories.

During the period between the Norman Wells discovery and the more recent Peel Plateau oil and gas strike, exploration in this district was concentrated in the southern district. Many of those were stratigraphic tests and no major finds were made although some gas was discovered at one but proved uncommercial and was consequently abandoned.

Peel Plateau. The strike here, located 320 miles west of the Norman Wells reef field, 95 miles east of the Alaska-Yukon border and 450 miles east-northeast of the Pacific Ocean, found oil and gas in the Permo-Pennsylvania. Three drill-stem tests were run over an interval of 100 ft. and condensate-bearing natural gas flowed at rates in excess of 8,000,000 cu. ft. Light-gravity oil also unloaded from the drill-stem during the last evaluation that covered the bottom 35 ft. of the interval tested. That zone has now been cased off and drilling is once again proceeding to lower formations. It has been rumored that another oil or natural-gas-bearing formation has been penetrated quite recently.

A more recent discovery has been made within this vast territory and should prove to be one of real significance for the region. Home Oil Co.'s 2 Celibeta Lake test found natural gas in the Middle Devonian-Slave Point horizon, only 30 miles north-northwest of Petitot River field in northeastern British Columbia. It has flowed up to 8,500,000 cu. ft. daily during production tests.

Land. The land picture in the Territories at the present time is a little unstable with many companies showing mixed emotions. Shell Oil Co., the largest landholder in the region with near 15 million acres, has done nothing in the district except a little geophysical work over the past year. It has been stated that that company along with many more of the major landholders are on the verge of dropping a great deal of it. If so, many other companies will undoubtedly take a good hard look at their spreads as well and some of the heat could come off.

Large deals are still being made in the district and wildcatting is going on at an unprecedented rate. There are at the present time 11 drilling rigs in the Territories, stretching from inside the Arctic Circle south to the Alberta-British Columbia and Northwest Territories boundary. Each one of them is a costly venture which can be shown best by the drilling equipment alone. In the central part of the Territories for instance, it is less costly to leave a $100,000 rig in the region than to move it out and down to the main exploration areas in Alberta and British Columbia.

Field Data, Yukon-Northwest Territories

	Field	No. of wells: gas	No. of wells: oil	Pay zone	Avg. footage
1.	Norman Wells	0	67	Devonian	1,470
2.	Rabbit Lake	1	0	Devonian	2,575
3.	Peel Plateau	1	dual gas/oil	Permo-Penn.	4,250
4.	Celibeta Lake	1	0	Slave Point	3,745

Soldotna discovery gives Alaskan oil a needed lift

THE BEST oil discovery yet in Alaska was made just last month at Soldotna, 1¼ miles south of nearest activity in Swanson River, the state's first oil field. Standard Oil Co. of California and Richfield Oil Corp. 41-4 Soldotna Creek Unit was tested for 1,870 bbl. of oil daily on ½-in. choke. Production is from Eocene-Hemlock sand at 10,228-10,585 ft. This is the same pay as that of Swanson River to the north.

This is the oil strike Alaska has been eagerly awaiting. It breaks a lull many months old since Swanson River started Alaska on the oil-producing trek. The discovery team has finished five producers at Swanson River, has two more in final drilling stages.

Standard of California and Richfield hold 92% of the 72,000-acre Soldotna Unit, which adjoins Swanson River Unit on the south. Standard is operator in both units. Sharing the 71,000-acre Swanson River Unit with Standard of California and Richfield are Union Oil Co. of California and Ohio Oil Co.

Expenditures. The oil industry spent $30,654,000 on oil and gas exploration and production in Alaska last year. Drilling and production costs in the new state were $13,940,000. There were 16 wells spudded and drilling on 4 other wells was done. Footage drilled totaled 137,902 ft.

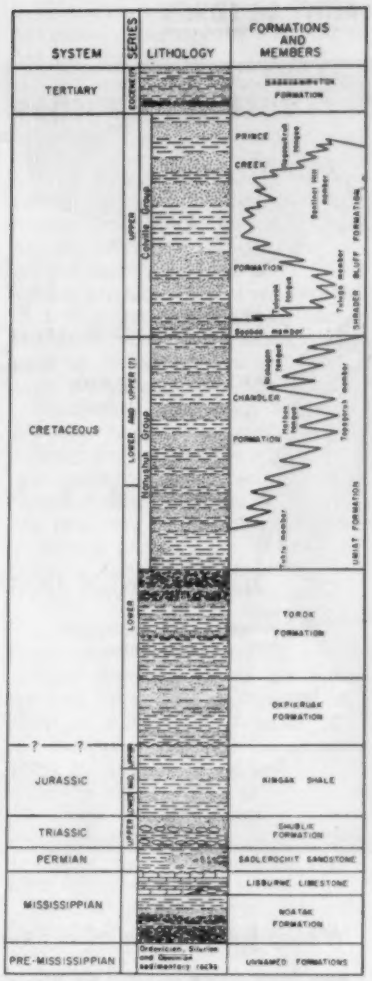
Exploration. Wildcat costs in Alaska in 1959 amounted to $16,714,000. Seven geophysical companies operated in the state. Seismic-crew-months totaled 92; gravity-meter-crew-months 7.5. There were 36 geologic field parties in Alaska, operated by 18 oil companies. The USGS had two parties in the field. A total of 552 party weeks was spent by the oil-company outfits. All parts of the state and every sedimentary basin were covered.

Lease sales. Alaska held its first competitive lease sale last December. Offshore lands leased included 77,831 acres for a total of $4,021,031.43, or $55.66 per acre. There were 101,639 acres held under state oil and gas lease at the end of December. This compares to 32,611,079 acres held under federal oil and gas leases.

Units. Five unit agreements were approved both by Alaska and the USGS. These covered: Kenai with 61,024 acres, Union Oil Co. as operator; Nulato with 99,840 acres, Paul G. Benedum as operator; Kaliakh River with 86,500 acres, Richfield Oil Corp. as operator; Soldotna Creek with 70,720 acres, with Standard of California as operator; and Bishop Creek with 38,557 acres, with M. T. Halbouty as operator.

Current activity. Richfield announced location for a second well in the Katalla-Yakataga area. The hole is the 2 Kalaikh, 2 miles north of the No. 1 well. It is located 5 miles north and 18 miles west of the Yakataga Federal Aviation Agency station. Clyde Hall Drilling Co. is the contractor on the No. 1 well which is drilling below 13,200 ft. The rig will drill the No. 2 hole. Richfield is exploring the area under development contracts which cover more than 1,000,000 acres extending along the Gulf of Alaska coastline.

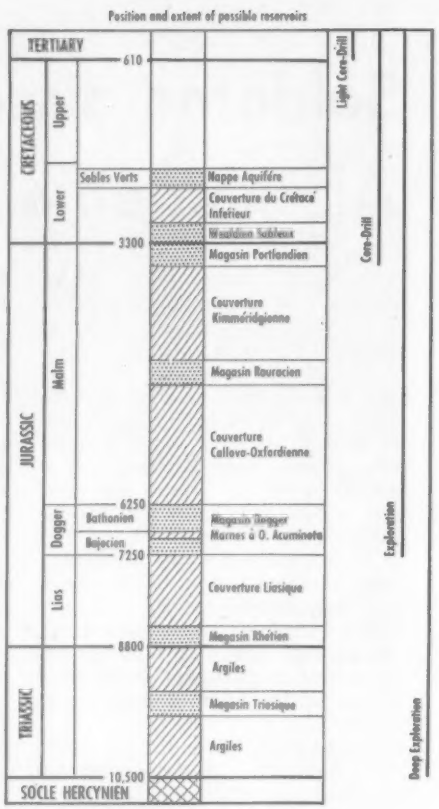
Benedum & Associates are drilling below 7,607 ft. at the 1 Nulato well in the Kateel-Koyukuk basin. Pan American Petroleum Corp. is drilling below 1,303 ft. at 2 Napatuk Creek in the Bethel-Kushokwim basin. At Swanson River, Standard-Richfield are below 2,576 ft. at 32-10, below 11,329 ft. at 14-27. On the Soldotna Creek unit, the team is rigging up at 32-4 after completing the 41-4 well on March 3.



COLUMNAR SECTION of Arctic Slope notes known oil and gas reservoirs of the slopes in the sandstones and graywackes of Cretaceous-Nanushuk and Colville groups. Kenai Peninsula oil comes from Tertiary Eocene.

ALASKAN WELL DATA

Field—	Well	TD (ft.)	Comp. date	Prod.
Swanson River	34-10	12,384	9-29-57	350-370 BOPD
Swanson River	31-27	12,046	12-10-58	270-300 BOPD
Swanson River	22-23	11,653	11-21-58	Dry hole
Swanson River	34-16	12,582	3-25-59	PB to 3,700 ft. and directionally drilled 34-16 to 14-15
Swanson River	14-15	11,460	7-25-59	50-100 BOPD
Swanson River	32-15	11,982	10-24-59	700-1,000 BOPD. Directionally drilled from 12-15
Swanson River	12-27	11,500	11-20-59	400-450 BOPD
Swanson River	14-27	11,329	.....	Fishing
Swanson River	32-22	11,774	1-5-60	Dry hole
Swanson River	23-22	11,614	3-9-60	550 BOPD
Swanson River	32-10	.....	.....	Drilling below 2,500 ft.
Soldotna Creek	41-4	11,315	3-14-60	700-900 BOPD
Soldotna Creek	32-4	.....	.....	Spudding
Kenai Unit	14-6	15,047	10-11-59	31 M.c.f.d.
Kenai Unit	34-31	5,809	12-15-59	17 M.c.f.d.
Kenai Unit	33-30	5,010	12-24-59	15 M.c.f.d.
Alaska	1 King	12,037	5-14-59	Dry hole
Bishop Creek	1 Unit	.....	.....	Spudding due soon



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Watch for the rise of a new oil power as . . .

Two basins power French push

METROPOLITAN FRANCE is approaching the status of a major oil-producing nation in western Europe. Last year's oil-hunting in France netted five new oil fields and one new gas pool.

Two basins feature the country's push to oil power . . . the Paris and Aquitaine. Four of last year's oil finds were in the Paris basin with new oil and gas production opened in the Aquitaine.

Paris basin. This is France's newest oil hopeful. First production was opened just 2 years ago at **Coulommes.** The Petrorep discovery, 1 Coulommes, was drilled on an anomaly found by a seismic survey and confirmed by core holes. The structure is about 12 miles long and 6 miles wide. Porosity is 15% with good permeability. The discovery well found oil in a 66-ft. section at 6,060-6,126 ft. in Dogger Middle Jurassic limestone. The Dogger produces extensively in Germany.

A field well at Coulommes came in last year for the best initial flow ever recorded in France at 5,000 bbl. daily. This prolific production was drilled on the east or Vaucourtois side of the field. It became the thirty-second producer in this section of the field. Production was from the top of the Dogger Jurassic limestone, entered at 5,570 ft. The big well was Petrorep 21 B.F.

Paris basin oil output amounts to about 6,000 bbl. daily. Coulommes accounts for more than 4,000 bbl. daily of this total.

. . . Villemer field. RAP expects to produce about 315 bbl. daily from this discovery well 40 miles southeast of Paris. The 101 Villemer tested 22 bbl. hourly from the top of the Dogger section entered at 4,950 ft. Development drilling is under way to define the structure. Villemer is 16 miles south of Brie field where RAP

FRENCH ACTIVITY SUMMARY

Footage drilled in 1959	1,293,871 ft.
Wells completed in 1959	213
Oil production, 1959	11,844,016 bbl.
Gas production, 1959	91,495,145 M.c.f.
Active rigs April 1960	37
Paris basin	9
Aquitaine basin	19
Others	9

France Field Data

Field—	Disc. date	Depth, ft.	No. of wells—Flowing	No. of wells—Pumping	Cum. prod. to 1959, bbl.	Gravity °API
Bollwiller	1958	6,000	...	...	1,300	...
Cazaux	1959	7,650	4	...	...	31.5
Chateaurenard	1958	1,700	3	...	48,111	...
Clermont	1957	7,500	...	...	3,200	...
Coulommes	1958	6,000	32	...	395,067	33
Donau-Soufflenheim	1954	1,650	...	11	196,833	30
Eschau	1956	2,900	1	5	114,584	34
Gallician	1951	6,600	2	...	218,371	25
Lacq	1949	2,200	17	15	15,752,186	22
Lucats	1956	7,450	...	1	23,581	37.9
Lugos	1956	5,000	...	6	516,554	20.6
Mothes	1955	7,900	4	...	824,638	20.9
Parentis	1954	7,600	20	10	33,652,116	33.8
Pechelbronn	1813	600-4,000	4	320	22,724,660	27.0
Reiminque	1955	4,760	1	2	99,726	40.0
Scheibenhardt	1956	3,000	15	1	424,476	32.0
Schirrheim	1954	1,800	...	...	34,700	29.0
Staffelfelden	1952	6,300	...	2	399,354	40.0
St. Martin de Bosenay	1959	4,500	2	...	18,280	32.3
Villemer	1959	4,950	1	...	...	...
Chailly-en-Biere	1958	...	21	...	...	...
Grandville	1959	6,780	1	...	...	...
Chartrettes	1959	...	1	...	...	...
Total France, 23 fields			126	373	75,447,737	

has seven producers. Brie is part of Chailly-en-Biere field, lying on RAP's side of the concession line. The Chailly side of the field is on acreage held by CEP which is producing more than 1,100 bbl. daily from 14 wells. Some of the recent wells make more than 300 bbl. per day.

... St. Martin de Bosseney. This discovery, Copesep 1, 65 miles southeast of Paris, was completed last summer flowing 375 bbl. of oil daily from a 243-ft. limestone section at the top of the Dogger formation entered at 4,500 ft. Pay here is three times as thick as at Coulommes.

...101 Grandville. RAP brought in a 75-bbl. per day well on a concession southeast of Paris in the Aube district last January 1959. Pay was found at 6,780 ft. in Dogger.

The smallest of new Paris basin fields is Chartrettes, 7 miles northeast of Chailly. RAP opened this field for 314 bbl. per day.

Aquitaine basin. There were two discoveries in southwestern France last year. One at Charlas, the other, an oil find, at Cazaux.

RAP has two small gas wells at Charlas, northwest of 21-year-old St. Marcet field. The latest test, a 2-mile stepout, flowed 70,000 cu. ft. of wet gas per hour from 7,100 ft.

Four producers have been completed in Esso-Rep's new field at Cazaux. The wells are on a 2½-mile east-west trend on the north shore of Lake Cazaux, 12 miles north of Parentis.

These wells are making from 250-320 bbl. per day, either flowing or partially on pump. Output is from two horizons of Albian sandstone topped at about 7,650 ft. and 7,820 ft. The fifth well in the field, 4 Cazaux, is starting to drill at a location between 1 and 2. The structure may extend eastward under an airport.

... Parentis. The field which put France in the oil business was opened in 1954. Esso brought in the discovery well 70 miles southwest of Bordeaux as a 3,000-bbl. producer. Pay is a dolomitic limestone found below 7,500 ft. in most of the wells. An upper fractured limestone is producing several wells on pump at a shallower depth. The field is now fully developed with 30 producing and 4 water-injection wells.

Parentis discovery was made by Esso Standard S.A. Francaise, but is now being operated by Esso Rep, controlled by Esso, but with minority interests shared by Gulf and the French Government.

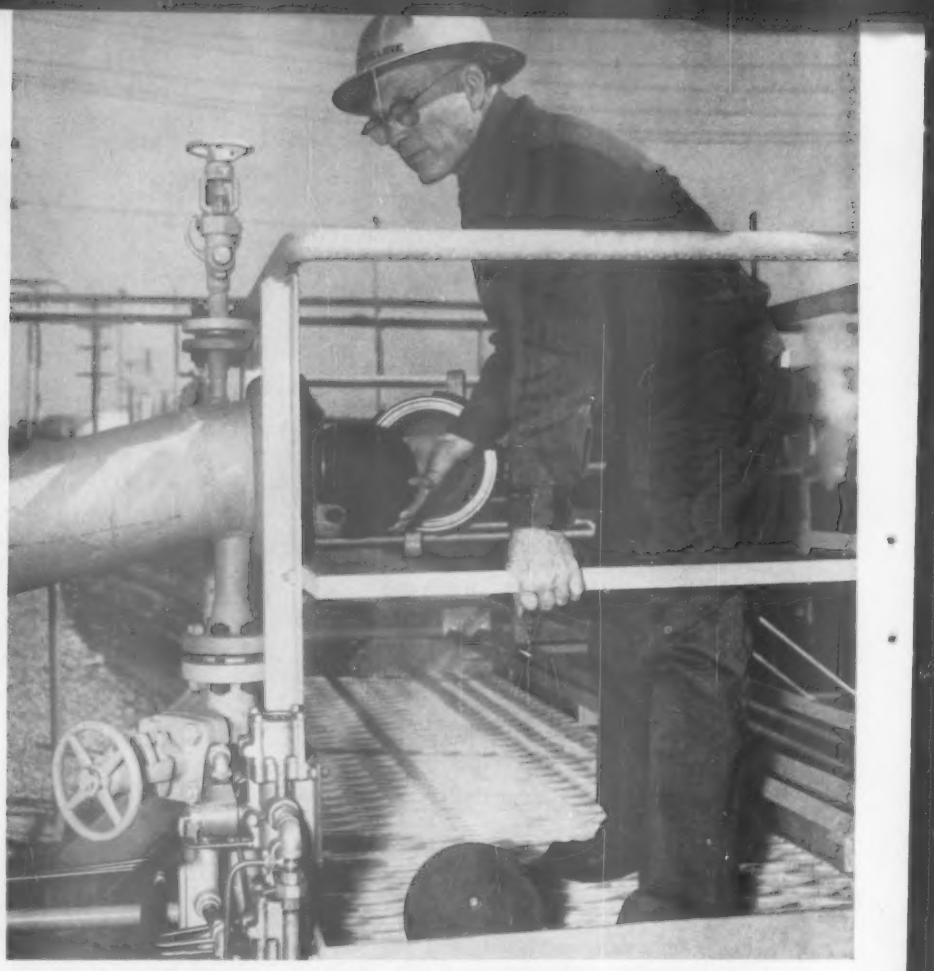
Mothes field is also fully developed with four producers as is Lugos with six oil wells.

... Lacq gas field. This big gas field in southwestern France contains from 10.5 to 14.0 trillion cubic feet of proven gas reserves. Its life is expected to last another 35 years. A recent 12,726-ft. well was completed as a producer, bringing to 26 the number of gas wells at Lacq. Pay here is the Neocomian at 12,490 ft. There is current exploration on the promising Lacq-Arzacq subunit of the Aquitaine basin, located in the foothills belt of the Pyrenees Mountains. There is also wildcatting on the west side of the Lacq anticline on the St. Suzanne feature. Other wildcats are drilling at Bordenave, at Poteau, 16 miles northwest of Lacq. The Poteau zone is an axial zone that separates the Lacq-Arzacq subunit from the Parentis basin. Another wildcat is drilling 20 miles southeast of Lacq near Nay. Drilling also is under way at Castelnau, 20 miles northeast of Nay.

COMPANIES OPERATING IN FRANCE

CEP, Compagnie d'Exploration Petroliere
FROPEX, France Outre-Mer de Prospection et d'Exploration Petroliere
PETROREP, Societe de Recherces Petrolieres dans la Region Parisienne
RAP, Regie Autonome des Petroles
CFPN, Compagnie Francaise des Petroles de Normandie
Mobil-REPGA, Societes Mobiloil and Recherche et Exploitation de Petrole et de Gaz
SAFREP, Societe Anonyme Francaise de Recherches et Exploitations de Petrole
ESSO REP, Societe Esso de Recherches et Exploitations Petrolieres
SNPA, Societe Nationale des Petroles d'Aquitaine
SPG, Societe des Petroles de la Garonne
CFPG, Compagnie Francaise des Petroles de Gascogne
CPG, Compagnie des Petroles de Guyenne
PREPA, Societe de Prospection et Exploitations Petrolieres en Alsace
SPV, Societe des Petroles de Valence
COPEFA, Compagnie des Petroles France Afrique
SIREP, Societe Independante de Recherches et d'Exploitations de Petrole

Reduction of commingling is prime target at airport line in California



LOADING a rubber spheroid into the launcher, from which they are fed into the main line in response in preset time controllers.

BY D. H. STORMONT
West Coast Editor

WHEN A PIPELINE is handling products valued at some $6 a barrel, any steps taken to reduce interfacial mixing can be quite worth while. If several products are handled, and size of the tenders is relatively small, minimizing contamination is especially important.

This is the case at a shipping station Shell Oil Co. has built at its Wilmington refinery to supply aviation fuels to the Los Angeles International Airport. Two grades of aviation gasoline and one grade of jet fuel are moved through the 20-mile 6-in. line. Tender sizes range from about 4,000 to 12,000 bbl., with pumping currently limited to one shift daily.

To minimize commingling during the frequent product switches, air-operated controls almost instantaneously close one manifold valve and open another. A rubber spheroid is launched in the line at the head of the interface and subsequent spheroids launched at intervals which result in minimum down-the-line commingling. Spheroids also are used for meter proving.

These functions, as well as switching of meter counters with each product change, are carried out automatically by preset controls. Pressing a button initiates the sequence.

Station facilities. Aviation gasoline and jet fuel are moved from storage through five lines to the station. Air-operated valves control the flow into a common manifold from which a motor-operated charge pump takes suction.

After passing through a 120-mesh strainer and either of two meters, the fuel is picked up at about 100 psi. by the main-line pump. Driven by a 350-hp. motor, the multistage centrifugal pump discharges into the main line at pressures of 750-800 psi. The spheroid launcher, capable of launching as many as 10 water-filled balls at preset time intervals, is located a few yards downstream.

Switching and launching of balls is controlled from a nearby panel. Prior to a product switch the valve to be opened and that to be closed are set off on the valve-selector dials. On three other dials the time of launching of the first ball and that of subsequent balls are set off. Pushing the control button for the valve to be opened initiates the entire sequence.

The air-operated valves are adjusted so that the line switch is made in less than 4 seconds. At normal pumping rates, the amount of commingling between contiguous products as a result of the switch thus is less than 1 bbl.

At the same time the switch is made, signals from the air-operated valves change the counter on the meter that is in service. Each meter has two counters and printout devices. The one in service prints out the final reading on the previous product run ticket. The initial reading for the new product is simultaneously printed on the ticket in the other counter head.

Spheroid launching. Experience with spheroidal separation in other Shell pipelines has proved the method very effectively reduces product intermixing. Also that best results are obtained if a number of spheroids are used.[1]

In the airport line the general practice is to launch one spheroid just ahead of the interface, one at the interface, then two or three at intervals of about 100 ft. As flow rate through the line is about 9 ft. per second, the balls trailing the interface spheroid are launched at intervals of about 11 seconds.

Time at which the first spheroid is launched is selected by setting the dial of an adjustable, preset time repeater controller on the control panel. Launching of the next two balls, and of any others after that, is alternately

handled by two other time-delay controllers.

The launching barrel can hold up to 10 balls but it is expected that no more than 7 will be discharged during any shipment. Air-operated controls actuate plungers at the lower end of the barrel, releasing one ball at a time in response to electrical signals from the delay controllers.

Meter proving. This is accomplished by dropping an additional spheroid well after the interface has passed. The meter factor is determined from the change in meter reading while the ball travels an 844-ft. section of line located a short distance from the station.

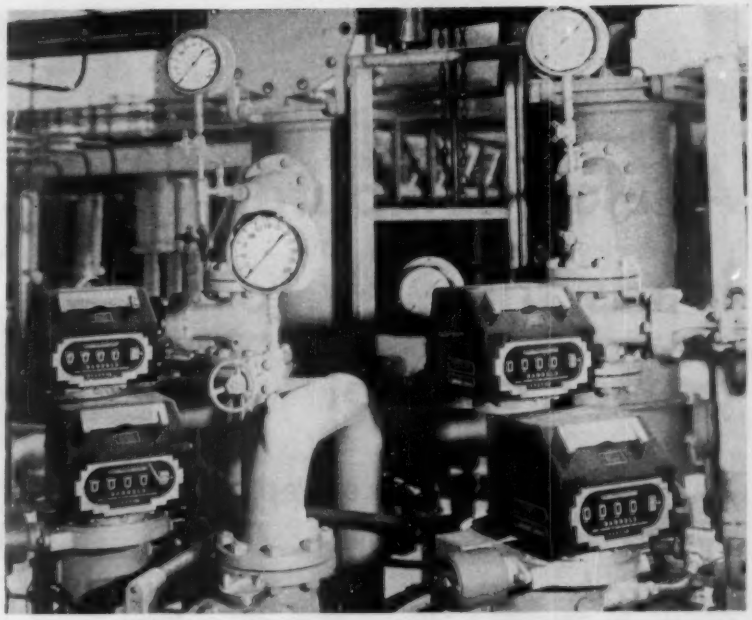
Contact of the ball with a scraper indicator at the beginning of the section actuates a pulse counter on the control panel. The counter automatically stops when the ball reaches a second indicator 844 ft. down the line.

The counter, by means of a magnetic pickup on the meter shaft, indicates the number of times the shaft has rotated while the ball was traveling the line distance of known volume. From this information the accuracy of the meter reading can be determined. The equipment has been designed so that a 10-second reading on the counter is roughly equivalent to the barrel per hour meter reading.

If there is any question as to the accuracy of the measurement, a second sphere is dropped. In initial operations of the line, the meter factor is determined for each shipment.

Airport facilities. At the terminus of the line the spheroids are shunted into scraper traps and the product is again metered. A calibrated section of pipe is provided for proving these meters, using the same type of facilities as those at the shipping station.

When the new International Airport is completed, regulations will prohibit the use of tank trucks for refueling planes. All loading will be done from underground hydrants, connected by underground lines to tankage some distance away. So that fuels can be moved quickly and with minimum pressure surges, Shell is installing lines as large as 18 in. Three 18,000-bbl., two 10,000-bbl., and two 5,000-bbl. tanks have been erected for storing the fuels.



WITH EACH PRODUCT SWITCH, metering changes from one counter head to the other automatically.

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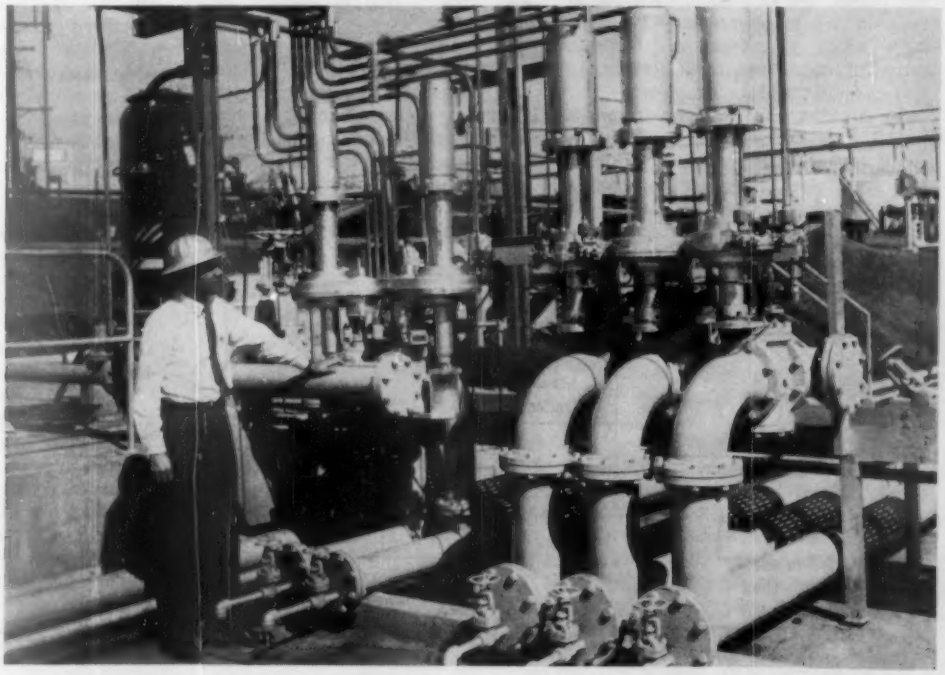


AIR-OPERATED VALVES permit a line switch in less than 4 seconds, reducing commingling to a minimum.

Analog computer leads the way to better control

Dynamic model concept applied to a solvent-dewaxing process provides some good answers

COAUTHORS L. T. Wright (standing) and R. S. Bettes taking data for their process-control study.

BY R. S. BETTES AND
L. T. WRIGHT
Standard Oil Co. of Indiana

ENGINEERS at Standard Oil Co. (Indiana) are using an analog computer, supplemented by conventional controllers and control valves, as a dynamic model of a process.

The model can be "operated" in the same manner that the unit will be operated, and the stability of the control system can be demonstrated for various operational conditions and upsets.

As opposed to the frequency-response[1, 2] approach, this model was developed on the basis of the physical principles involved in each piece of equipment and in each process operation. In this manner a model can be built which is useful over the full range of operations from startup, to full capacity, and to shutdown.

In contrast, the frequency-response model is highly accurate over only a small operating range, requires plant test data, and is usually useless for startup and shutdown simulation.

The model based on physical principles is more realistic to those who are not control-systems experts, and it leads to more useful interchange of ideas between model builders and users of the results.

Building a model. Data required to build a dynamic model of a unit on an analog computer are engineering, equipment, and the usual process information. Subsections of the over-all model are analog models of individual pumps, exchangers, towers, piping, and valves. Various subsections of the model are interconnected so that all flow, energy, and pressure balances are satisfied.

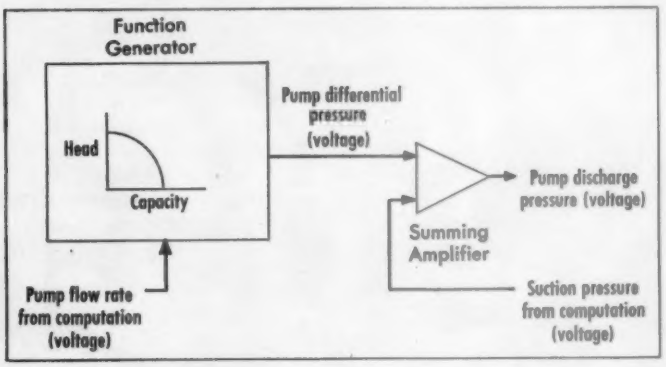
Some equipment models are simple. Others are more complex. The model of a centrifugal pump, for example, is nothing more than an arbitrary function generator depicting the head-capacity curve for the pump (Fig. 1).

The computed flow through the pump exists as an electrical voltage in the complete model. This voltage, when supplied to the function generator, provides an output voltage representing the pressure rise across the pump. Pressure rise, as a voltage, added to pump inlet pressure, as a voltage, yields discharge pressure, as a voltage. Some of the more complicated circuits, required for simulating heat exchangers with thermal lags, pipes with transport lags, and receivers with composition lags, have been discussed elsewhere[2].

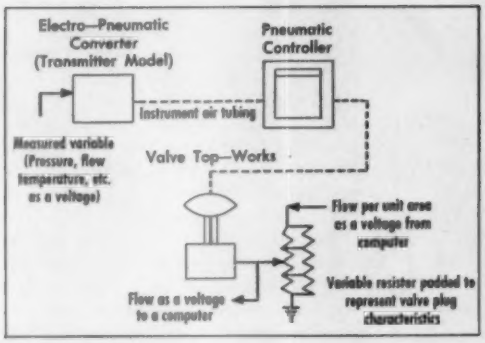
Since analog-computer components are never available in unlimited supply, some judgment is required in the extent to which minor details are included or excluded in the model. Furthermore, the time required for designing and debugging the model increases rapidly as more computer equipment is used. Experience shows that elaborate models are not required to get useful results. This is reasonable, for an operating plant should not have to depend on control or understanding of some complex secondary effect in the equipment.

A further simplification and cost reduction, in the analog model, results if the controllers and control valves are not analoged (Fig. 2). The use of conventional controllers tied to valve topworks provides actual performance of these components and permits "operation" of the model from the controllers just as the commercial plant would be operated.

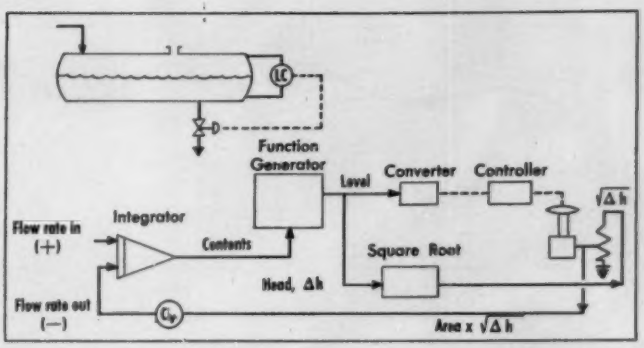
Lengths of instrument air tubing can be included to represent remote



ANALOG MODEL of a centrifugal pump. Fig. 1.


Electro—Pneumatic Converter (Transmitter Model)
Pneumatic Controller
Instrument air tubing
Measured variable (Pressure, flow temperature, etc. as a voltage)
Valve Top—Works
Flow per unit area as a voltage from computer
Variable resistor padded to represent valve plug characteristics
Flow as a voltage to a computer

COSTS ARE REDUCED if controllers and control valves are not analoged. Fig. 2.



PHYSICAL PRINCIPLES are used to create the dynamic model, thus making it easily understood. Fig. 3.

locations of controllers and valves. The valve topworks are modified to operate variable resistors rather than valves so that the flow calculations can be made in the computer. The variable resistors give valve-stem position, if used directly, or they may be appropriately padded to give valve opening area directly.

When pneumatic controllers are used, electropneumatic converters are used to go from the analog computer to the controllers. These converters in effect replace the actual transmitters.

Example model. To show the construction of a dynamic model based on physical principles, a simple example can be used (Fig. 3). Water flowing into an open horizontal drum is drained under level control to the atmosphere. Physically, the integrated difference between inlet and outlet flow rates is the volume of water in the drum. Since the drum is horizontal, level is a nonlinear function of the volume of water in the drum. Flow through the outlet depends on valve size, valve-stem position (or per cent opening area), and square root of the differential head across the valve.

The analog model makes use of these physical facts. Inlet flow rate as a positive voltage, and outlet flow rate as a negative voltage, are supplied to an integrator whose output is the volume of water in the drum at any time. The arbitrary function generator changes volume to level in the drum. The level signal is used to operate the converter which simulates the level transmitter; it also represents the head across the drain valve. The square-root circuit and the padded variable resistor on the valve topworks provide a voltage proportional to the product of per cent valve opening area and square root of head. This product requires modifying only by the valve size coefficient, c_v, to produce the outlet flow rate.

The "physical-fact" model thus created is easily understood. Operation of the system can be demonstrated by imposing a changing inlet flow rate and recording the other variables of interest.

Plant application. In a commercial solvent dewaxing unit, the solvent-recovery section was unstable in operation.

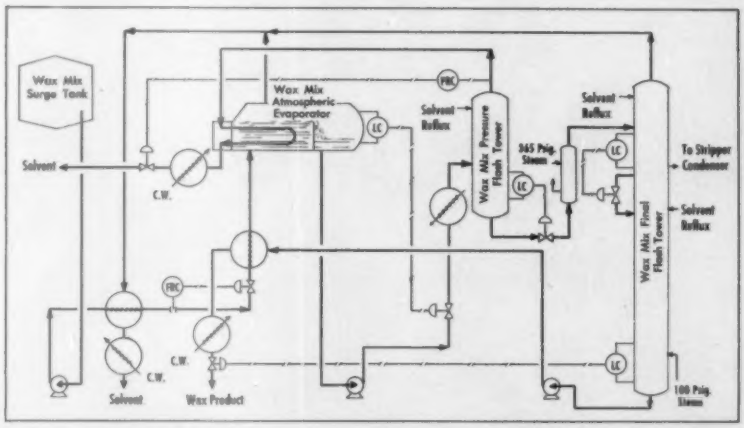
A simplified process-and-control diagram of the original system is shown in Fig. 4. The unit uses three simple flash or evaporation stages followed by steam stripping of the wax product. It is tightly heat-balanced to minimize utility requirements. The wax-solvent mixture is preheated by exchange with products and evaporated at atmospheric pressure to remove a part of the solvent. A weir in the evaporator shell creates a surge drum at one end of the shell. Steam heating followed by a pressure flash at about 35 psig. and further steam heating followed by an atmospheric flash remove the major portion of solvent from the wax product. Pressure flash vapors provide much of the heat for the primary evaporation.

In the original control system, total feed was flow-controlled and pressure-flash tower operating pressure was controlled by flow of pressure-flash vapors. The effective condensing surface for pressure-flash vapors changed as the flow-controller permitted more or less flow. Levels were controlled in a conventional manner by control of flows.

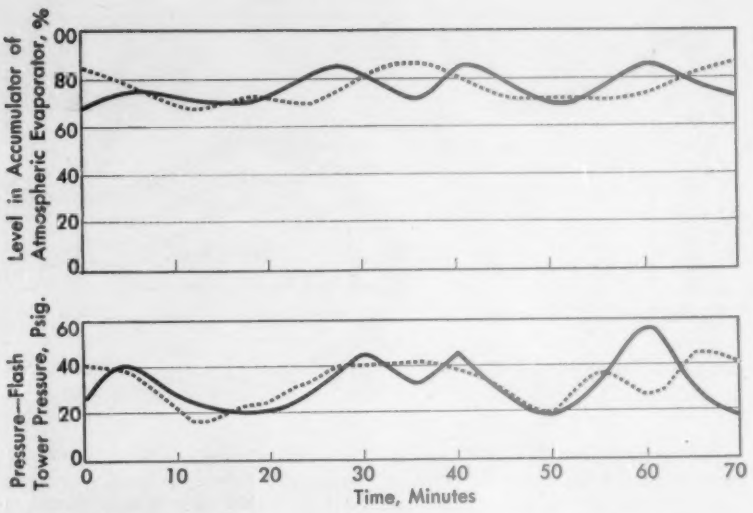
From startup it was evident that stability of the system was poor at low flow rates and at high solvent contents of the feed. Frequent variations in solvent content of the feed were unavoidable due to intermittent filter washing. There were wide, undamped oscillations in pressures, temperatures, and levels as shown by typical plant data in Fig. 5.

While it was obvious that a number of thermal loops existed in the plant and that these loops were responsible for poor performance, it was not possible to predict with certainty which loops were the major offenders. Simulation of the plant on an analog computer was undertaken so that a workable control system could be devised.

Since the particular model under discussion was that of an existing plant, the first task was to show that the model behaved in the same man-



ORIGINAL CONTROL SYSTEM of solvent-dewaxing unit. Thermal loops caused unstable performance. Fig. 4.



WIDE VARIATIONS in levels and pressures were recreated in the model to correspond to instability in the plant. Fig. 5.

ner as the plant. Typical computer records (Fig. 5) show instability in the model corresponding to instability in the plant.

Since recording any measurement in the model is easy, analysis of cause and effect is much simpler than in the field. It was quickly determined that the major loop creating disturbances in the plant was the one from the atmospheric evaporator to the pressure flash tower and back to the atmospheric evaporator.

Composition lags in the evaporator and its receiver section beyond the weir, transport lags in the piping to the pressure flash tower, thermal lags in the exchangers (especially in the atmospheric evaporator with its partially flooded tube bundle), and instrument lags contributed in varying degrees to the instability.

With an analog model, it is easy to change control functions, equipment sizes, or piping arrangements. As few equipment and piping modifications were made as possible. Various modifications of the control system were tried. Startup, normal operations, and upset operations were studied.

We wanted the modified plant to start up easily, to work at any feed composition from pure solvent to minimum expected solvent, to operate at all needed flow rates, and to accept reasonably large changes in controller settings without upset. In addition to designing and demonstrating the modified unit on the computer, optimum settings of proportional band, reset rate, and derivative action for all controllers were determined.

The revised control system is shown in Fig. 6. Revisions included reassigning control functions of three controllers, changing the range of the level controller on the atmospheric evaporator, and eliminating the weir in the atmospheric evaporator by cutting a large hole in it.

Operation of the unit with the revised control system has been extremely smooth. The manual station for setting throughput is the only operating control used in running the plant. All the automatic controllers are left at their operating set points and on automatic control during startup and operation. Wide swings in solvent content of the feed have no upsetting effect and the unit runs smoothly at all throughputs.

A secondary benefit of the analog model study was demonstrated in one upset which occurred after installation of the revised control system. Behavior during the upset was similar to analog operation of the system before the weir was taken out of the atmospheric evaporator. The log book showed that the operator had lowered the level-controller set point at the start of the upset.

Increasing the set point of this controller restored good operation. Apparently the lowered set point corresponded to a point below the hole in the weir and restored weir action.

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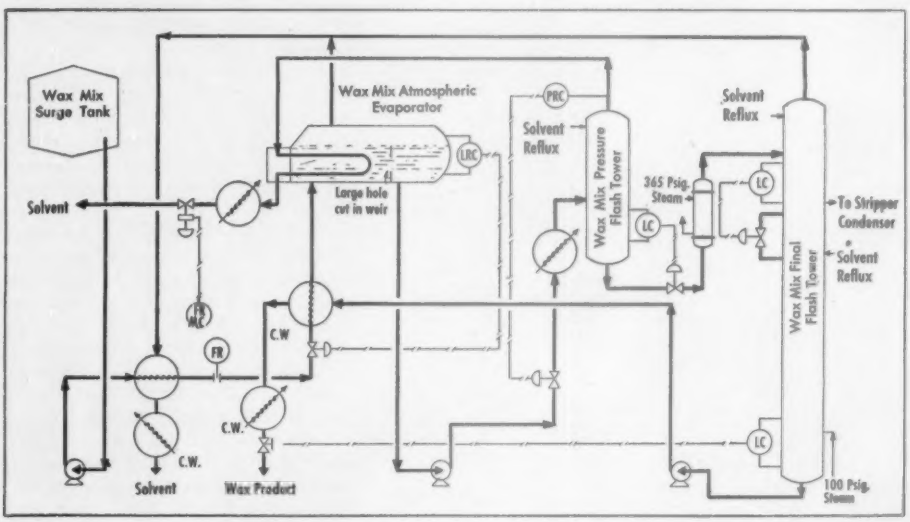
2. Process Instruments and Controls Handbook, D. M. Considine, Ed., McGraw-Hill, 1957.
3. "Simulation of a Solvent Recovery Process," by L. G. Lewis; Instruments and Automation, April 1958.



REVISED control system installed after analog-model study resulted in smooth operation at any throughput. Fig. 6.

SWANSEA HARBOUR SOUTH WALES

This ingenious new fire-fighting float, the "BP Firemaster", was designed by BP. It can deliver 3,100 gallons of water a minute at a pressure of 100 pounds per square inch, or alternatively 12,500 gallons of foam a minute.

BP

FIELD COATING of welds with zinc silicate gives same protection as carefully controlled shop application. Fig. 1.

SEVEN YEARS of severe exposure has left the coating on both hot and cold lines in almost perfect condition. Fig. 2.

Zn_2SiO_3 coatings prove they can take it

SEVEN YEARS ago a large Oklahoma gas-processing and cycling plant facing a severe corrosion problem with its cooling-tower piping applied a single 2½-mil. coat of zinc silicate. Today, after years of continual exposure, the coating is still in almost perfect condition.

Application. This coating was applied to all cooling-tower piping and surrounding equipment in 1952. The piping was sandblasted and shop coated by a commercial applicator for $0.25 per square foot. There was no damage to the coating during transportation or installation. Damage to the coating in the area of the welds was repaired by wire brushing and applying one coat of inorganic zinc silicate and one coat of curing solution by brush. The condition of these areas (Fig. 1) indicates that field repairs offers the same satisfactory performance as more carefully controlled shop applications.

Operating conditions in the area of this piping are very severe and may be attributed to a number of factors. One is the temperature range at which the tower operates. Compressed natural gas enters heat exchanger tubes at 245° F. and is discharged at 88° F. This temperature drop is accomplished by cascading water over the tubes.

Another is the composition of the water itself. The water has a comparatively high pH factor ranging from 7.9 to 8.1. The alkalinity rating is 96 and the hardness of the water measures 500 p.p.m. Algae are controlled by chlorine and slimecide.

Yet another factor leading to bad conditions in the area of the cooling tower is the high level of moisture present in the form of fine dew or mist. This factor alone led to cracking, pitting, and adhesion loss of coatings previously used on the tower piping.

First inspection. Inspections in August and September of 1955 were made to determine the condition of the zinc silicate on the cooling tower piping in the north bay of the west tower following 3½ years of continual exposure. The inspections consisted of checking the thickness of the coating and peening the pipe to determine if rust had undercut the film. Two doors of the tower were selected at random and a detailed inspection made of the coating at points where pipes enter the tower and alternate wet and dry conditions are encountered.

The only areas of coating failure were found on one of the cold return lines located approximately 20 ft. from the tower. The areas were about 2 in. in width by 4 ft. in length and were located on opposite sides of the pipe. The film thickness of the coating adjacent to the bad areas averaged only ½ mil, which suggested that the areas were inadequately covered at the time of application.

Fig. 2 shows one of the hot lines, all of which were covered with a heavy, hard scale. At points where the scale could be removed the coating was found to be intact. Some scaling was discovered on the cold lines adjacent to the doors but these lines were predominantly clean and accurate inspection was possible which showed the coating to be almost perfect in spite of the long exposure.

A second inspection of the piping and surrounding equipment was made in January of 1959 and revealed the coating to be in almost the same condition as it was during the 1955 examination.

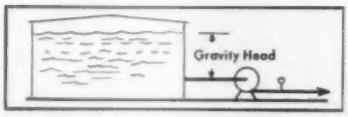
The two areas of coating failure discovered in 1955 and subsequently repaired were examined closely and found to be on a par with the rest of the protective system. From this disclosure it is almost certain that the failures were due to faulty application rather than a deficiency in the coating itself or any extraordinary condition in that particular pipe.

The coating used on the cooling tower and all surrounding equipment is a zinc silicate called Dimetcote manufactured by Amercoat Corp. of South Gate, Calif. It is applied to bare steel and cured by heat or a chemical curing process developed by the manufacturer.

Other uses. This same coating can be used on offshore drilling platforms, decks, hulls, masts, stacks, and booms of marine vessels, interior surfaces of petroleum tankage, decks of floating-roof tanks, interior surfaces of petroleum clean-oil tankers, and as a prime coat for chemical-resistant coatings in corrosive atmospheres.

Demonstrations show fluid-flow principles

What makes fluid flow?



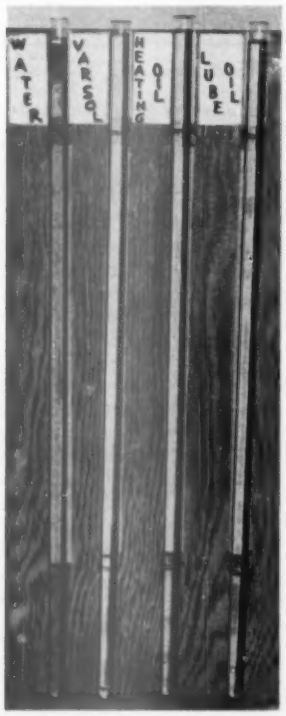
DEMONSTRATION 1

Difference in pressure makes a fluid flow. Sources available to produce pressure are:

(a) Gravity head.

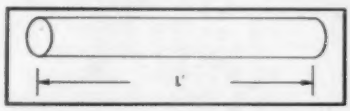
(b) External—pump or compressor required to move fluid from low to high pressure locations.

What factors affect rate of fluid flow?



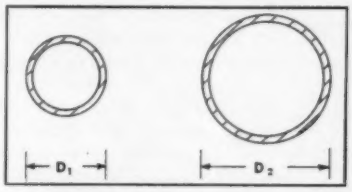
DEMONSTRATION 2A

(a) Viscosity—the property of a fluid that makes it tend to resist movement. Simultaneously, drop four steel balls into four different fluids. They will fall at different rates. Raising temperature of a fluid reduces its viscosity and makes it easier to pump.



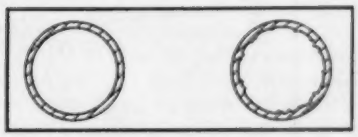
DEMONSTRATION 2B

(b) Pipe length—resistance to flow is given in pressure drop per 100 ft. of pipe.



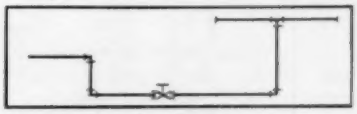
DEMONSTRATION 2C

(c) Pipe diameter—The larger the diameter, the lower the pressure drop at a particular rate of flow.



DEMONSTRATION 2D

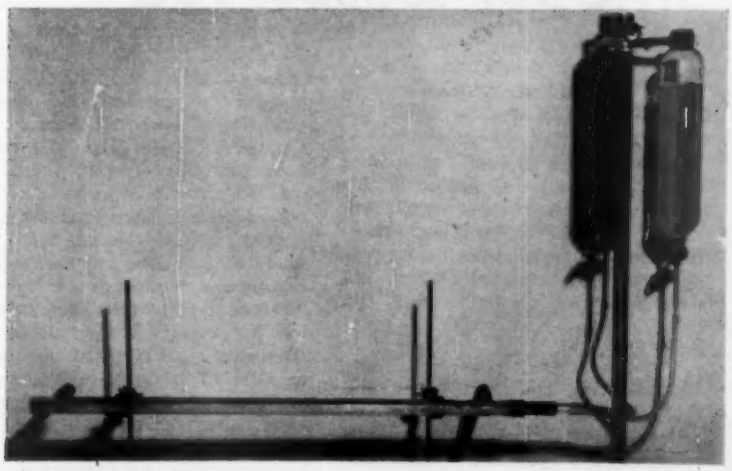
(d) Pipe condition—The rougher the internal surface, the greater the pressure required to produce a particular flow rate.



DEMONSTRATION 2E

(e) Fittings—Resistance to flow by fittings is given in equivalent lengths of straight pipe in the illustration above. Different kinds of fittings will produce different resistances to fluid flow.

Velocity determines what kind of flow?



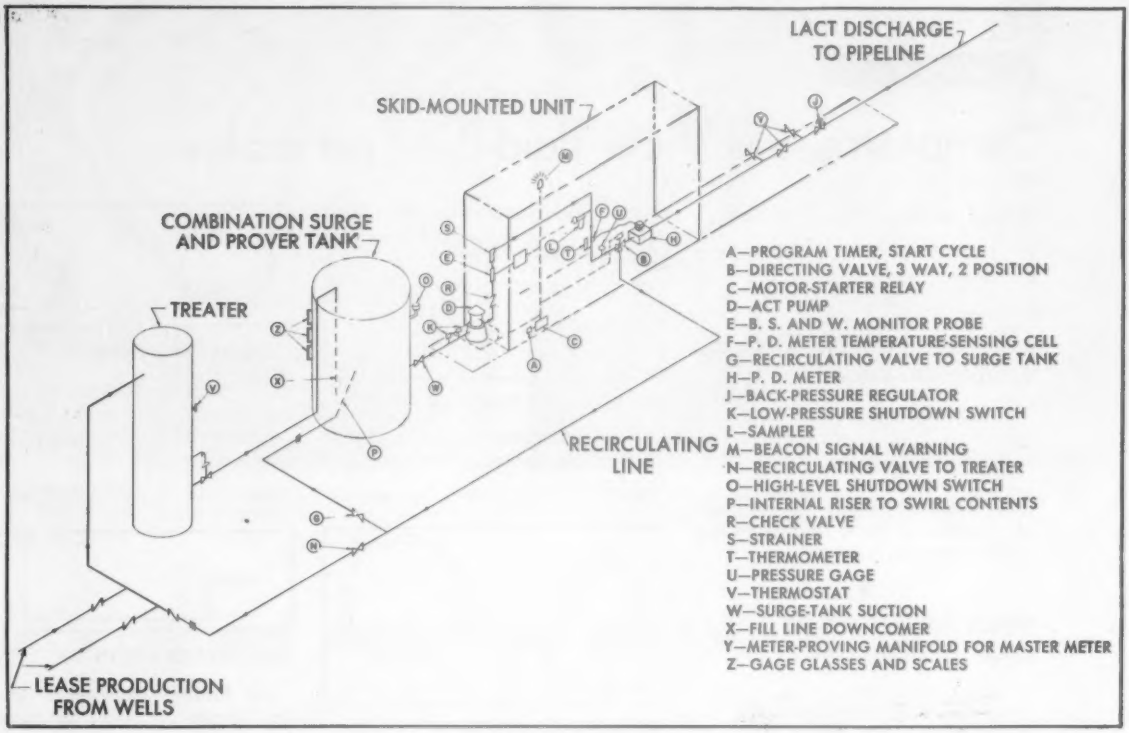
DEMONSTRATION 3

Streamline flow occurs at low velocities. Little agitation and mixing of fluid occurs.

Turbulent flow occurs at higher velocities. The fluid swirls and mixes. This type of flow is required for good heat transfer or mixing.

The apparatus demonstrates these two types of flow using dye and black light.

This material taken from process-training-program manual, Bayway, N. J., refinery of Esso Standard Oil Co.



FLOW DIAGRAM for skid-mounted LACT-unit installation with p.d. meter, 30 to 700-bbl. per day meter proving by modified surge tank or master meter.

LACT will work on stripper leases, too

BY PAUL W. TRUMAN
Sinclair Oil & Gas Co., Tulsa

MANY TYPES of LACT units have been built and found practical. This article covers the stripper lease application of LACT by positive-displacement meters. Installations of the type described here are in operation, and have been economical, accurate, and practical. And they require a minimum of maintenance.

Fabrication. The entire LACT unit is shop fabricated with all equipment, except the ACT pump and pump-start relay. These are protected from weather and maintained at a minimum temperature of 60° F. The meter house, ACT pump, suction manifold, meter-proving manifold, back-pressure valve, and discharge manifold are all connected, wired, and mounted by the fabricator on a steel skid approximately 9 by 3 by 7 ft. The total weight is under 2,000 lb. The total cost is under $3,500.

Presented at API Division of Production spring meeting, Wichita, March 30-April 1, 1960, under the original title: "Applications of LACT by Positive-Displacement Meters to Stripper-Lease Operation."

Installation. The complete skid-mounted LACT unit is easily transported to the lease site and requires no concrete foundation or lease gas connection. Only three pipe connections are required in the field installation—one 2-in. line from the directing valve to the surge tank; one 4-in. line from suction to the surge-tank outlet valve; and one 2-in. line from the discharge manifold to the pipeline connection. All conventional and usual "fail-safe" features are built into the skid-mounted unit. Only four electrical connections are necessary in the field to provide (1) a thermostat in the heater to shut down the unit should temperature in treater become abnormal, (2) a high-level float switch on the surge tank to shut in the lease, (3) a rotating beacon light to warn of any abnormal condition at the LACT unit, and (4) a connection must be made from the electric service pole to the skid-mounted unit. Electrical requirements are 3-kw., 115 to 230-volt single-phase.

When p.d. meters with automatic temperature compensation are used for ACT on small leases, 30 to 700 bbl. of oil per day, it is desirable to

Here's how the transfer cycle works

At 8 a.m. program timer (A) causes directing valve (B) to move to the "circulate" position. Electrical contacts are then actuated by the position of the valve stem to latch up the motor starter (C), causing the ACT pump (D) to take suction from the surge tank (W), and oil is pumped at 8 psi.—1 bbl. per minute—through the b.s. and w. monitor probe (E), and p.d. meter temperature - sensing cell (F) only (not through the meter or into the sample container), then through the directing valve (B), and through the normally open recirculating valve (G) into the surge tank. Starting a transfer cycle in this manner accomplishes the following:

1. Eliminates the cost and dan-

ger of installing conventional float switches in the surge tank.

2. Tests the three-way, two-position electrically operated directing valve for mechanical or electrical failure before each ACT run is made. Should the valve fail, then the ACT pump cannot start.

3. The b.s. and w. monitor probe cell is flushed out and brought to the approximate temperature of the oil to be delivered before oil is allowed to pass through the p.d. meter.

4. The temperature bulb and its compensator mechanism are brought to the approximate temperature of the oil to be delivered before it passes through the meter.

5. Any gas or air which may have accumulated during downtime will be flushed into the surge tank and not through the p.d. meter (H).

After a predetermined interval of recirculating (approximately 15 minutes), the timer causes the directing valve (B) to move to "deliver" position, thereby allowing pump pressure to open the back-pressure - regulator valve (J) and permit oil to pass through the p.d. meter (H), on which the temperature-compensating devices have become adjusted to the temperature of transferred oil. The register on the p.d. meter now indicates barrels, corrected to 60° F. The meter is equipped with a ticket printer.

The ACT pump (D) will continue to take suction from the surge tank and deliver through the b.s. and w. monitor probe (E) (monitor sensing merchantable oil), the sampler (now operating), the p.d. meter, and the back-pressure regulator (J) to the pipeline at a rate of approximately 31.5 gallons per minute and at a pressure of 10 psi. maximum until the liquid level in the surge tank is lowered sufficiently to cause the low-pressure shutdown switch (K) (located in the pump suction line) to terminate that transfer cycle. The range of the low-pressure shutdown switch is adjustable to provide sufficient storage in the surge tank to allow the oil to become stabilized.

Sampler (L). The sample valve is in the center of the vertical stream, upstream of the directing valve. However, because the sample valve is actuated electrically, it can never take a sample until the directing valve is directing oil to the p.d. meter and pipeline. This is due to electrical contacts located on the directing valve stem itself.

B.s. and w. monitor. Oil passes through the monitor probe (E) in a vertical stream at all times while the pump is running. Should the b.s. and w. content exceed some predetermined percentage, the monitor opens the directing valve (B) and oil is recirculated into surge tank; and at the same time any further delivery to the pipeline is prevented until the oil has been cleaned up. The beacon signal (M) is activated, calling attention to this condition. Operating personnel may then open valve (N), close valve (G), and recirculate surge-tank contents through the treater. Lease production will continue to recirculate until the oil is cleaned up or the surge tank reaches the high-level shutdown switch (O), which will shut in all wells.

Controls. The program timer (A) may be set for as many "starts" per day as may be needed to transfer the daily production. There are 96 start points available per 24-hour period.

The "CIRC," "OFF," "AUTO" selector switch, when set to AUTO position, allows the timer to start the ACT cycle. When set on CIRC position, the directing valve (B) will open and start the pump. Recirculation will continue until the selector switch is returned to OFF or AUTO position. After the selector switch has been returned to OFF or AUTO position, oil will be transferred through the p.d. meter to the pipeline until the normal low level in the surge tank is reached or until the STOP button is pressed. When the selector switch is set to OFF position, no starts are possible from the program timer.

bring the temperature - compensating devices to the approximate temperature of the oil to be delivered before this oil passes through the meter to the pipeline. To accomplish this, the temperature-sensing bulb is removed from the meter case and equipped with a 60-in. capillary tube. The bulb is then mounted upstream from the directing valve, where it senses the temperature of the oil from the surge tank which is being recirculated before transfer is begun through the p.d. meter.

In the interest of accuracy, it is advisable to make pipeline delivery in increments of not less than 30 bbl. There are no conventional float-operated switches in the surge tank so the LACT cycle is initiated by a program timer. This may be set to start as many cycles per 24-hour period as required to transfer average daily production in increments of not less than 30 bbl. each.

Economics. This simplified installation reduces labor and material costs, thereby creating more favorable economics for stripper-lease operation.

In the interest of further economy in LACT for small-lease operation, two methods are suggested for proving temperature-compensated p.d. meters. The use of either method must be mutually agreeable to all parties concerned.

1. It is proposed that, on meter-proving day, the pipeline company furnish a portable master meter to be connected in series with the LACT-unit discharge-test manifold at (Y), upstream from the back-pressure regulator.

2. It is proposed to modify a standard welded steel stock tank for use as a combination surge and prover tank. The interior of the tank should be coated with an epoxy-resin compound to reduce internal buildup of paraffin, etc., and the tank should be stuffed in accordance with API Std. 2501.

Only the lower portion of the tank should be used as a surge tank. The upper two-thirds of the vessel is to remain clean and to be filled to the upper level on meter-proving dates only.

The entire content of the tank is to be circulated for 1 hour or longer on meter-proving day to insure a mean temperature before proving the meter. Immediately after circulation, it is possible to establish an acceptable "meter factor."

Both of these methods are being used by pipeline and producing companies, and they yield satisfactory meter factors. The use of either method, of course, effects a considerable saving over the cost of providing a separate "meter - prover tank" for each unit.

Conclusion

The greatest opportunity for automation in crude production lies in its adaptation, economically, to small leases. To be of any value in small lease operation, the LACT units must be rugged, accurate, capable of long unattended operation with a minimum of maintenance, and of course fit into the overall economics of production costs. Experience has shown that the use of p.d. meters, properly installed, provides a most economical, accurate, and trouble-free means of volumetric determination for this type of service.

Approximate annual consumption of chemicals

(since 1926)

BY W. L. NELSON
Technical Editor and Petroleum Consultant

THE END USES of chemicals can seldom be computed with accuracy and accordingly the tabulation on this page is only an approximation. It was obtained, however, from the technical and business literature except for the year 1956 (see Process Costimating No. 64, January 11, 1960, p. 97) and except the last six columns of cost which were built up from prices (Process Costimating No. 58, October 12, 1959, p. 186). The consumptions shown here and the estimates of the total cost of the chemicals used in the petroleum refining were also used.

Estimates of the total costs of chemicals from the literature or personal files indicate somewhat as shown in the tabulation at right.

	—Cents per bbl.—	
		Found here
1931 7-plant avg.	4.6	3.7
1931 3 lube plants	7.1	...
1931 Avg. plants	3.9	3.7
1931 Sour oil	6.6	...
1937 Avg. plant	4.9	4.5
1939 Avg. plant	5.9	6.0
1941 Avg. U.S.A.	7.9	7.6
1944 100-octane plants	31.1	...
1947 West Coast processing	9.6	8.6
1951 Avg. plants	14.3	13.1
1952 Avg. plants	16.8	14.3
1952 No lubes	13.6	...
1958 Little lube (little TEL and lube crude)	12.0	...
1958 No lubes—(little TEL)	12.3	...

Amounts and costs of chemicals used in petroleum refining

	Chemical consumption index[a]		Refinery runs	Sulfuric acid (100%)[b]	Caustic soda[c]	TEL[d]	Others	—Cost, 10^6 $ per year—			—Costs, cts. per bbl.—		
	U.S.A.	Refineries	1,000 B/D	10^6 lb.	10^6 lb.	10^6 lb.	10^6 lb.	Chemicals	TEL	Total	Chemicals	TEL	Total
1926	...	...	2,834	....	...	..	.....	21.3	...	22	2.1	...	2.1
1928	...	...	3,036	....	...	..	.....	21.2	...	21	1.9	...	1.9
1929	36.6	34.2	3,326	1,952	292	17	PbO 27	21.7	...	..	1.8	...	..
1930	33.4	30.1	3,635	1,764	260	20	PbO 24	22.0	36.0	57	1.65	2.7	4.3
1931	27.9	25.9	3,707	1,700	228	18	PbO 15	20.7	30.6	50	1.5	2.2	3.7
1932	21.2	19.4	3,625	1,542	200	13	PbO 10	17.4	19.9	37	1.3	1.5	2.8
1933	26.8	24.9	3,445	....	...	17	.....	16.7	24.0	41	1.35	1.9	3.2
1934	28.8	26.5	3,554	....	...	36	.....	17.7	32.7	51	1.35	2.5	3.9
1935	32.7	34.3	3,615	1,218	180	41	.....	19.2	33.8	53	1.45	2.55	4.0
1936	37.6	40.1	3,715	1,368	176	48	Ash 23	20.9	36.0	57	1.55	2.55	4.1
1937	42.7	44.0	3,967	1,470	194	54	Clay 361	25.2	38.8	64	1.75	2.7	4.5
1938	33.5	29.1	3,970	1,368	192	58	Ash 23	28.6	41.4	70	1.95	2.85	4.8
1939	40.6	43.4	3,934	1,506	198	76	Clay 317	30.2	56.5	87	2.1	3.95	6.0
1940	46.1	45.6	4,197	1,568	...	110	PbO 12	33.2	71.6	105	2.15	4.7	6.8
1941	53.2	49.2	4,180	1,742	211	139	Clay 274	38.2	79.5	118	2.45	5.2	7.6
1942	55.5	46.6	4,497	1,800	...	90	Ash 28	42.8	45.9	89	2.6	2.8	5.4
1943	57.7	50.5	4,409	1,880	260	116	.....	49.0	57.6	107	3.0	3.6	6.6
1944	59.4	58.6	4,709	2,040	280	136	PbO 11	58.3	67.5	126	3.35	3.9	7.3
1945	61.3	60.5	5,078	2,270	290	149	Phenol 11	62.3	74.0	136	3.4	4.0	7.4
1946	65.8	60.8	5,086	2,000	300	131	.....	69.5	64.8	134	3.7	3.5	7.2
1947	72.5	64.7	5,336	2,360	300	160	SO_2 6.4‡	90.5	77.5	168	4.65	4.0	8.6
1948	75.1	70.2	5,825	2,440	340	206	.....	114.0	109.0	223	5.35	5.1	10.4
1949	70.8	68.5	6,230	2,420	320	227	.....	106.0	131.0	237	4.65	5.75	10.4
1950	82.5	72.8	6,223	3,100	...	285	MEK 7	113.0	161.0	274	5.0	7.1	12.1
1951	86.5	82.8	6,709	3,448	*400	281	Phenol 12	144.0	177.5	322	5.85	7.2	13.1
1952	85.3	86.0	7,161	3,626	...	327	Clay 500	170.0	207.0	377	6.45	7.9	14.3
1953	89.5	89.6	7,482	3,560	...	386	Ash 66	196.0	244.0	440	7.15	8.95	16.1
1954	87.2	89.0	7,782	3,540	...	408	Ash 66	224.0	252.0	476	7.9	8.85	16.8
1955	98.1	95.8	8,069	3,600	430	443	Cata. 564§	274.0	262.0	536	9.0	8.9	17.9
1956	100.0	†100.0	7,920	3,800	500	475	Ash 70*	308.0	285.0	593	10.7	9.85	20.5
1957	100.2	101.5	7,925	3,840	...	499	HF 6	300.0	303.0	603	10.4	10.5	20.9
1958	95.8	96.9	7,580	3,750	500	473	.....	306.0	284.0	590	11.1	10.3	21.4

*Estimate. †6,400,000,000 lb. general chemicals (1956) and 475,000,000 lb. of TEL. ‡Although stated on a national basis, this is only representative of West Coast refiners. §Not including those for polymerization or alkylation.

[a]Consumption Index of magazine "Chemical Engineering," converted to 1956 basis.
[b]Mainly from Keith and Forrest, Ref. Nat. Gaso. Mfr., July 1934, p. 259; Skeen, J. R., Chem. Eng., April 1950, p. 337; Forbath, T. P., Chem. Eng., Aug. 1956, p. 278 and April 1957, p. 208; Anon, Chem. & Eng. News, March 1954, p. 882.
[c]Mainly from Keith and Forrest, Ref. Nat. Gaso. Mfr., July 1934, p. 259; and Anon., Chem. Eng., Jan. 1951, p. 286.
[d]See Process Costimating No. 68, ———— 1960, p?

Monthly Report on PIPELINE CONSTRUCTION

PIPELINE ACTIVITY reported here is compiled from surveys by The Oil and Gas Journal among pipeline companies and construction contractors.

This summary report appears in the last issue of the Journal each month. New construction projects are reported weekly in Pipeline Briefs in the Journal's news section.

Projects are listed in three groups—U. S., Canadian, and Foreign—and according to type of line—crude, products, or natural gas.

★ The star symbol indicates the first appearance of the project in the Journal's survey.

U. S. Crude Oil Pipelines

Belle Fourche Pipeline Co., Box 1612, Casper, Wyo.

Project: 103-mile 8-in. line from Fiddler Creek field to Lance Creek, Wyo., and other lines to serve Roset, Miller Creek, and Lone Tree fields.

Status: Pending approval of Wyoming Public Service Commission.

Buckeye Pipe Line Co., 30 Broad St., New York 4, N. Y.

★ Project: 54 miles of large-diameter extension in Michigan. The 22-in. line will be extended from Toledo to Samaria, and a 16-in. line will be built from Samaria to refineries at Trenton and Detroit.

Status: Planned.

Cape Pipe Line Co. (Sun Oil Co., Cities Service Co., Atlantic Refining Co.), Philadelphia.

Project: Line from lower Delaware Bay to Philadelphia.

Status: Planned.

Cooperative Refinery Association, Kansas City, Mo.

Project: 6 miles of 6-in. at Stockton, Kans.

Status: Planned.

Completion: Spring 1960.

Gillette Pipeline, Inc., and **A. W. Hartwig, Inc.**

Project: A 102-mile line from Dead Horse Creek field to Casper, Wyo.

Status: Pending Wyoming Public Service Commission approval.

Great Northern Railway, St. Paul, Minn.

★ Project: 110-mile line linking Lignite and Newburg fields in North Dakota to the carrier's main line at Minot.

Status: Pending state approval.

Humble Pipe Line Co., Box 2220, Houston 1, Tex.

★ Project: 63 miles of 8-in. trunk line and a gathering system to serve Sacotosa field in Maverick County, Southwest Texas.

Completion: Early summer 1960.

International Oil Pipeline Corp., New York City.

Project: Would own U. S. section of 1,500-mile, 30-in. line proposed by Mid-Continent Pipe Lines, Ltd., from Edmonton, Alta., to Chicago. (See Canadian Crude-Oil Pipelines).

Status: Proposed.

International Refineries, Inc., 227 North Colfax Avenue, Minneapolis, Minn., and **Barron Kidd,** Dallas, Tex.

Project: Crude-gathering system in Wiley field, Bottineau County, North Dakota.

Status: Planned.

Matador Pipe Line Corp., Denver, Colo.

Project: 175-mile line to carry crude from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man., where it would tie in with the Interprovincial pipeline.

Status: Proposed. Representatives of Western Crude Marketers, Inc., Denver, have been conducting feasibility studies in North Dakota. Matador's application is pending before the Canadian Parliament.

Completion: Tentatively early summer 1960.

Shell Pipe Line Corp., Box 2648, Houston, Tex.

Project: 32½ miles of 2 to 6-in. gathering lines.

Status: Planned.

Completion: 1960.

Standard Oil Co. of California, San Francisco.

Project: 22 miles of 8-in. from Swanson River Unit on Kenai Peninsula to Nikiski on Cook Inlet, Alaska.

Status: Planned.

Completion: Mid-1961.

U. S. Products Pipelines

Continental Pipe Line Co., Drawer 1267, Ponca City, Okla.

★ Project: 85-mile 6-in. line from Helena to Great Falls, Mont.

Status: To start in June.

Completion: Fall 1960.

Farmers Union Central Exchange, Inc., Box G, St. Paul 1, Minn.

Project: 200 miles of 8-in. from Glendive, Mont., to Minot, N. D.

Status: Proposed.

Great Lakes Pipe Line Co., Drawer 2239, Kansas City 42, Mo.

★ Project: 58 miles of 8-in. from Grinnell to Waterloo, Iowa.

Status: Bids were to be received April 18.

Humble Oil & Refining Co., Houston.

Project: About 34 miles of 4-in. line to move propylene from Baytown refinery to petrochemical plant at Texas City.

Husky Oil Co., Cody, Wyo.

Project: About 100 miles from Cody to the Yellowstone products line west from Billings, Mont.

Status: Planned.

Completion: Late 1960.

Magnolia Pipe Line Co., Box 900, Dallas, Tex.

★ Project: 60 miles of 6-in. from Daisetta to the Mobil refinery at Beaumont, Tex.

Status: Under way.

Contractor: **Panama, Inc.,** Houston, Tex.

Mid-America Pipeline Co., (Missouri-Kansas-Texas Railroad), New York.

Project: 2,300-mile LPG system from West Texas-New Mexico area to upper Midwest. Main line would be 1,500 miles, with extensive gathering systems, to connect gasoline plants in West Texas, southeastern New Mexico, and Texas Panhandle. The line from the Southwest would fork at McPherson, Kans., with one branch going to Minneapolis and the other to Madison, Wis. Size of pipe would be 8 and 10-in. with branches 6 to 8-in.

Status: Under way.

Contractor: **Williams Brothers Co.,** Tulsa, has engineering, management, and construction.

Completion: December 1960.

New Haven Pipeline, Inc., 515 Madison Ave., New York 22, N. Y.

★ Project: 12-in. line from New Haven to Hartford, Conn., and 10-in. from there to Springfield, Mass., with a 6-in. spur to Westover Air Base at Ludlow, Mass.

Status: Proposed.

Phillips Petroleum Co., Bartlesville, Okla.

★ Project: 45 miles of 3-in. from Artesia, N. M., field-processing plant to Phillips' Mex-Tex line.

Status: Planned.

Seadrift Pipeline Corp. (subsidiary of Union Carbide Corp.).

Project: 108 miles of line from Union Carbide's Seadrift, Tex., plant, to Humble Oil & Refining Co.'s King Ranch plant at Ella, Tex.

Status: Planned.

Contractor: **Pipe Line Technologists, Inc.,** Houston, has contract for engineering and construction supervision.

Texas Eastern Transmission Corp., Box 1189, Houston.

★ Project: 90-mile extension of Little Big Inch from Lebanon to Lima, Ohio.

Status: Planned.

★ Project: 10 miles of 8-in. LPG line from Mt. Belvieu to Baytown, Tex.

Completion: June 1960.

Texas Pipe Line Co., 1111 Rusk Avenue, Houston, Tex.

Project: 42 miles of 6-in. LPG line from the New Hope natural-gasoline plant in Franklin County, Texas, to the Nettleton station.

Completion: June 1960.

U. S. Natural Gas Pipelines

Anchorage Gas Corp., Houston.

Project: 165 miles of line at least 12-in. in diameter from Kenai Peninsula to Anchorage.

Status: Planned. Construction may start late April or early May 1960.

Arkansas Industrial Pipeline Corp. (Arkansas Louisiana Gas Co.), Shreveport, La.

Project: 130 miles of 18-in. from Perla to Helena, Ark.

Completion: 1960.

Arkansas Louisiana Gas Co., Shreveport, La.

Project: About 58 miles of 2, 3, 4, and 6-in. line in various locations.

Completion: 1960.

Carolina Pipeline Co., Box 1531, Columbia S. C.

★ Project: 12 miles of 6-in. in the Florence, S. C., area.

Status: Planned.

Completion: June 15, 1960.

Central Hudson Gas & Electric Corp., South Road, Poughkeepsie, N. Y.

Project: 16 miles of 10-in. from Sleightsburg to Highland, N. Y.

Status: Under way.

PIPELINE CONSTRUCTION

Contractor: **C. N. Flagg & Co.,** Meriden, Conn.
Completion: September 1960.

Cities Service Gas Co., Box 1995, Oklahoma City 1, Okla.
Project: 13 miles of 16-in. from Alden field, Rice County, Kansas, to the company's Lyons station; 10 miles between Lyons and Hutchinson; and 9 miles near Wichita.
Status: Pending FPC approval.
Completion: By fall 1960.

Coastal States Gas Producing Co., Corpus Christi, Tex.
Project: 60 miles of 10-in. in La Salle and Frio counties, Texas.
Completion: June 1960.

Coastal Transmission Corp., Houston.
Project: 65 miles of 3, 4, 6, and 10-in. in Texas and Louisiana.
Status: Pending before FPC.
Completion: Summer 1960.

Colorado Interstate Gas Co., Box 1087, Colorado Springs, Colo.
Project: 7 miles of 20-in. in Texas Panhandle.
Status: Pending FPC approval.
Completion: 1960.
Project: 109 miles of 26-in. from Four-Way station in Texas Panhandle, to Morton Junction in southeastern Colorado; 135 miles of 34-in. from there to Pueblo, and 107 miles of 30-in. on to Denver; 155 miles of 34-in. from CIG line at Rock Springs, Wyo., to Provo, Utah, to connect with proposed El Paso Natural Gas Co.'s line to California.
Status: Pending FPC approval.
Completion: 1960.
Project: 32 miles of 6-in. from Central Colorado to Trinidad.
Status: Pending FPC approval.
Completion: 1960.

Colorado Oil & Gas Corp., Denver.
Project: 402-mile line from Gubik field to Fairbanks, Alaska.
Status: Proposed.

Colorado-Wyoming Gas Co., Box 480, Denver 1, Colo.
Project: 4 miles of 3½-in. from main line to Erie, Colo.
Status: Planned.
Completion: August 1960.

Columbia Gulf Transmission Co., Box 1916, Houston, Tex.
Project: 6 miles of 24 and 30-in. at Mississippi River crossing near Providence, La.
Status: Pending FPC approval.
Completion: November 1, 1960.

El Paso Natural Gas Co., Box 1492, El Paso, Tex.
Project: 19 miles of 20-in., 40½ miles of 16-in., 26 miles of 12-in., and 36 miles of 10-in. from existing 26-in. main line in Cowlitz County, Washington, to Eugene, Ore.
Status: Under way.
Contractors: **Hood Construction Co.,** Whittier, Calif., and **River Construction Corp.,** Fort Worth, Tex.
Completion: Fall 1960.
Project: 17 miles of 5-in. lateral from an interconnection with Pacific Gas Transmission Co.'s proposed 36-in. line in Klamath County to near Klamath Falls, Ore.
Status: Pending FPC approval.
Project: 24 miles of 20-in. from Puckett, Tex., to Goldsmith plant; 51.3 miles of 20-in. from Terrell to Puckett Plant discharge; and 23 miles of 20-in. from Goldsmith to Eunice-Dumas line.
Completion: 1960-61.
Project: 244 miles of 30-in. Permian-San Juan Line loops.
Status: Under way.
Contractor: **R. H. Fulton & Co.,** Lubbock, Tex., has contract for 126 miles in New Mexico, with office in Tatum, N. M.
Completion: 1960-61.
Project: 395 miles of 34-in. from Salt Lake City, to California border near Las Vegas, Nev.
Status: Pending FPC approval.
Completion: January 1, 1961.
Project: 54½ miles of 16-in., 5½ miles of 20-in., and 20 miles of 2 and 4-in. from east central Ochiltree County, Texas, to Shamrock Oil & Gas Corp.'s Stewart compressor.
Status: Under way.
Contractor: **Vaughn & Taylor Construction Co., Inc.,** Odessa, Tex.
Completion: June 1960.

Equitable Gas Co., 420 Boulevard of the Allies, Pittsburgh, Pa.
Project: 58 miles of 16 and 20-in. from Marion County, West Virginia, to Washington County, Pennsylvania.
Status: Pending FPC approval.
Completion: Fall 1960.
Project: 17 miles of 16-in. in Marion and Monangalia counties, West Virginia.
Contractor: **Joyce Pipeline Co.,** Andover, N. Y.
Completion: August 15, 1960.
Project: 3½ miles of 20-in. in Greene County, Pennsylvania.
Contractor: **Joyce Pipeline Co.,** Andover, N. Y.
Completion: August 15, 1960.

Gulf Resources, Inc., New York.
Project: 136 miles of 14 and 20-in. from Hidalgo County to LaSalle County, Texas.
Status: Pending FPC approval.

Hope Natural Gas Co., Clarksburg, W. Va.
Project: 20 miles of 24-in. line in Wetzel and Monongalia counties, West Virginia, replacing two 16-in. lines.
Status: Approved.

Houston Pipe Line Co., Box 2412, Houston, Tex.
Project: 35 miles of 18-in. from Sheridan to Wharton, Tex., in the Houston area.
Status: Under way.
Contractor: **Sheppard-Geiger Construction Co.,** Corpus Christi, Tex.

Houston Texas Gas & Oil Corp., Box 10400, St. Petersburg 33, Fla.
Project: 270 miles of 2 to 6-in. lateral lines.
Status: Pending FPC approval.

Illinois Power Co., Decatur, Ill.
★ Project: 22 miles of 12, 14, and 16-in. near Belleville, Ill.
Status: Under way.
Contractor: **Cape Construction Co.,** Cape Girardeau, Mo.

Iron Ranges Natural Gas Co., St. Paul.
Project: 79 miles of 10 and 12-in. from Grand Rapids to Hoyt Lake, Minn., and 67 miles of 12-in. from Duluth to Silver Bay, Minn.
Status: Approved by FPC.
Completion: 1960.

Kansas-Nebraska Natural Gas Co., Inc., Phillipsburg, Kans.
Project: Enlargement of gathering facilities in Kansas' Hugoton field, including 10 miles of 8-in., 10 miles of 20-in., and about 2 miles of 26 and 30-in.
Completion: August 1, 1960.
Project: 15 miles of 4-in. from Kimball, Neb., to a gathering line north of Kimball.
Completion: July 1, 1960.
Project: 56 miles of 2-in. to serve several communities in Kansas.
Completion: September 1, 1960.

Laclede Gas Co., St. Louis, Mo.
Project: 107 miles of 24-in. between Hallsville, and St. Louis, Mo.
Status: Proposed.

Manufacturers Light & Heat Co., Union Trust Building, Pittsburgh 19, Pa.
Project: 70 miles of 20-in. from Sideling Hill Mountain to Abbottstown, Pa.
Status: Under way.
Contractor: **Williams Brothers Co.,** Tulsa, Okla.
Completion: September 1960.
Project: 33 miles of 20-in. from Point Marion to Route 40 near Addison in Somerset County, Pennsylvania.
Status: Planned.
Completion: September 1960.
Project: About 8 miles of 4 to 16-in. line in the Victory storage area, Marshall County, West Virginia.
Status: Planned.
Completion: September 1960.

Michigan Wisconsin Pipe Line Co., 500 Griswold Street, Detroit 26, Mich.
Project: 342 miles of 24-in. and 188 miles of 30-in. main-line loop.
Status: Pending FPC approval.
Completion: September 1, 1960.
Project: 9 miles of 6-in., 17 miles of 8-in., and 11 miles of 12-in. lateral loops in Wisconsin.
Status: Pending FPC approval.
Completion: September 1, 1960.
Project: 69 miles of 24-in., 28 miles of 20-in., 96 miles of 16-in., and 118 miles of 4 to 8-in. in Wisconsin.
Status: Approved by FPC.
Completion: November 1, 1960.
Project: 29 miles of 30-in. main-line loops.
Status: Pending FPC approval.
Completion: November 1, 1960.

Midwestern Gas Transmission Co., Houston.
Project: 504 miles of 24-in. from Emerson, Man., to Marshfield, Wis., plus 54 miles of sales laterals.
Status: Approved by FPC and National Energy Board of Canada. Construction to start spring 1960.
Completion: November 1, 1960.

Mississippi River Fuel Corp., 407 North 8th Street, St. Louis 1, Mo.
Project: 5 miles of 16-in. and 15 miles of 12-in. from Collinsville, Ill., to St. Jacob, Ill.
Status: Pending FPC approval.

Mississippi River Transmission Corp. (Mississippi River Fuel Corp.), St. Louis.
Project: 115 miles of 24-in. from near Oran in southeast Missouri, north between Ste. Genevieve and Bonne Terre into vicinity of Herculaneum and Pevely then into St. Louis County.
Status: Planned.
Completion: Last half 1960.

Mountain Fuel Supply Co., 180 East 1st South Street, Salt Lake City, Utah.
Project: 7 miles of 24-in. from Mountain Dell to Salt Lake City's Sunnyside station.
Status: Proposed.
Completion: 1960.
Project: 6 miles of 20-in. from Kanda Junction to Green River, Wyo.
Status: Proposed.
Completion: 1960.

Natural Gas Gathering Co., Inc., Corrigan Tower, Dallas, Tex., and **Gulf Resources, Inc.**
Project: 31 miles of 10, 12, and 14-in. in Zapata and Starr counties, Texas.
Status: Pending FPC approval.
Completion: Fall 1960.

Natural Gas Pipeline Co. of America, 122 South Michigan Avenue, Chicago Ill.
Project: 5 miles of 8-in. in Grady County, Oklahoma.
Status: Pending FPC approval.
Project: About 18 miles of 4 to 10-in. gathering lines in Carson County, Texas.
Status: Pending FPC approval.
Project: 151 miles of 36-in. intermittent sections paralleling mainline facilities between Ford County, Kansas, and Joliet, Ill.
Status: Pending FPC approval.
Project: 180 miles of 24-in. between Kiowa County, Oklahoma, and Minneola, Kans.
Status: Pending FPC approval.

Natural Gas Storage Co. of Illinois, 122 South Michigan Avenue, Chicago 3, Ill.
Project: About a third of a mile of 10-in. and about a half mile of 20 and 24-in. at

storage facilities in Kankakee County, Illinois.

Completion: August 15, 1960.

Project: About a half mile of 36-in. Illinois River crossing.

Status: Pending FPC approval.

Completion: September 23, 1960.

Niagara Mohawk Power Corp., Syracuse, N. Y.

Project: 104 miles of 12-in. from Watertown, N. Y., to Massena, N. Y.

Status: Planned.

Completion: November 1960.

★ Project: 22 miles of 6-in. from Massena to Malone, N. Y.

Status: Planned.

Completion: November 1960.

★ Project: 17 miles of 6-in. from Watertown to Carthage, N. Y.

Status: Planned.

Completion: September 1960.

Northern Illinois Gas Co., 50 Fox Street, Aurora, Ill.

Project: 75 miles of 30-in. from underground storage at Troy Grove to the company's distribution system near LaGrange, Ill.

Status: Scheduled to start in spring 1960.

Completion: By September 1, 1960.

Northern Indiana Public Service Co., Hammond, Ind.

★ Project: 8 miles of 16-in. line from South Bend, Ind., to Elkhart, and 4½ miles of 30-in. in the Calumet region.

Status: Planned.

Completion: 1960.

Northern Natural Gas Co., Omaha, Neb.

Project: 217 miles of main line, 221 miles of main-line loops, and 2,178 miles of branch lines of various diameters.

Completion: 900 miles were completed in 1959.

Project: 36.5 miles of 2 to 16-in. gathering lines at Otis gas field, Rush County, Kansas, for underground storage, and 36.7 miles of 30-in. transmission line connecting Otis storage area to main line at Bushton, Kans.

Status: Pending FPC approval. ,

Project: About 21 miles of 16-in. and 26 miles of various small diameter pipeline in the Glick field, Kansas, area in Kiowa, Comanche, and Barber counties.

Status: Pending FPC approval.

Project: 188 miles of 24-in. and 215 miles of 30-in. from Farmington, Minn., to International border.

Status: Proposed.

Project: 83 miles of 20-in. from East Dubuque, Ill., to Janesville, Wis.

Status: Pending FPC.

Completion: Fall 1960.

Ohio Fuel Gas Co., 99 North Front Street, Columbus 15, Ohio.

★ Project: 21 miles of 4½ to 24-in. line in various counties in Ohio.

Status: Pending FPC approval.

Ohio Oil Co., Findlay, Ohio.

Project: 28 miles of gathering line to move casinghead gas to proposed natural-gasoline plant in south central Michigan.

Status: Under way.

Contractor: **Somerville Construction Co.,** Ada, Mich.

Oklahoma Resources Development Co., Cameron Building, Oklahoma City.

Project: About 170 miles of 12-in. trunk line from Oklahoma City to Harrah and Muskogee, Okla., and about 130 miles of 4 to 12-in. lateral from the Greasy Creek area of Hughes County and from Blaine and Logan counties.

Status: Planned.

Completion: November 1, 1960.

Old Ocean Fuel Co. (subsidiary of Texas Electric Service Co.), Fort Worth, Tex.

Project: 364 miles of 16, 20, and 24-in. from the Gulf Coast south of Houston to the Fort Worth area.

Status: To start in May 1960.

Contractors: **H. B. Zachry Co.,** San Antonio, Tex., and **O. R. Burden Construction Corp.,** Tulsa, Okla.

Completion: December 1960.

Pacific Gas & Electric Co., San Francisco.

Project: 120 miles of 34-in. looping of Topock-Milpitas main line.

Status: Planned. Pending FPC approval.

Completion: 1961.

Project: 11 miles of 20-in. from Pittsburg to Walnut Creek, Calif.

Contractor: Using company crews.

Completion: 1960.

Project: 296 miles of 36-in. from the California-Oregon border to Antioch, Calif. (This is part of the project to import natural gas from Canada, which will include the Pacific Gas Transmission project listed below.)

Status: Pending approval from governments.

Completion: 90 miles scheduled for completion in 1960, the rest in 1961.

Pacific Gas Transmission Co. (Pacific Gas & Electric, San Francisco).

Project: 614 miles of 36-in. from Kingsgate, B. C., to California border near Klammath Falls, Ore.

Status: Pending approval of FPC.

Pacific Lighting Gas Supply Co., Los Angeles.

Project: 116 miles of 34-in. from Needles to Newberry, Calif.

Status: Under way.

Contractors: **Engineers Limited Pipeline Co.,** San Francisco, and **Pacific Pipeline Construction Co.,** Montebello, Calif. **Missouri Valley Dredging Co.,** Omaha, has contract for a dual 24-in. crossing of the Colorado River near Needles.

Completion: July 1, 1960.

Pacific Northwest Pipeline Corp., Salt Lake City, Utah.

Project: 18 miles of 20-in. and 40 miles of 16-in. from main line near Camas, Wash., to Salem, Ore.

Status: Pending before FPC.

Completion: 1960.

Project: 60 miles of 12-in. from Salem to Eugene, Ore.

Status: Planned.

Completion: 1960.

Project: 61 miles of 4, 6, and 8-in. gathering line in Big Piney field, Wyoming.

Status: Planned.

Completion: 1960.

Project: 9 miles of 12-in. gathering line in Red Wash field, Uintah County, Utah.

Status: Planned.

Completion: 1960.

Panhandle Eastern Pipe Line Co., 1221 Baltimore Avenue, Kansas City, Mo.

Project: 100 miles of 4 to 12-in. gathering lines.

Contractor: **Hall Construction Co.,** Liberal, Kans.

Completion: December 31, 1960.

Project: 315 miles of 30-in. and 40 miles of 26-in. loops on main line.

Status: Pending FPC approval.

Completion: Fall 1960.

Peoples Gas Light & Coke Co., 122 South Michigan Avenue, Chicago 3, Ill.

Project: 29 miles of 36-in. between its North Shore and Calumet stations in the Chicago area.

Status: Planned.

Completion: 1960-62.

Peoples Gulf Coast Natural Gas Pipeline Co., 122 South Michigan Avenue, Chicago 3, Ill.

Project: 371 miles of 30-in. of present system between Texas and Chicago.

Status: Pending FPC approval.

Completion: November 15, 1960.

Project: About 59 miles of various size looping of main line in Brazoria, Galveston, Aransas, and Refugio counties, Texas.

Status: Pending FPC approval.

Completion: November 15, 1960.

Peoples Natural Gas Co., Two Gateway Center, Pittsburgh 22, Pa.

Project: 37 miles of 12 and 20-in. in various parts of Pennsylvania.

Status: Planned.

Contractor: **Joyce Western Corp.** has contract for 8 miles of 20-in. from Imperial to Aliquippa, Pa.

Completion: From June to October 1960 for most of the line.

Phillips Petroleum Co., Bartlesville, Okla.

★ Project: 85 miles of 2 to 16-in. gathering lines in Eddy County, New Mexico.

Status: Under way.

Contractor: **Lasley Construction Co.**

Completion: October 16, 1960.

Pioneer Natural Gas Co., Amarillo, Tex.

Project: 21 miles of 12-in. from Sudan to Muleshoe, Tex.

Status: Pending FPC approval.

Project: 12 miles of 10-in. from Muleshoe, Tex., northward.

Status: Pending FPC approval.

Public Service Co. of North Carolina, Gastonia, N. C.

Project: About 47 miles of 4, 8, and 10-in. in North Carolina.

Rocky Mountain Natural Gas Co.

Project: 65 miles of gas line in southwestern Colorado to supply Collbran, Montrose, Delta, and Orchard City.

Status: Planned.

Southern California Gas Co., Los Angeles.

Project: 13 miles of 34-in. from San Fernando Valley (Los Angeles) to West Los Angeles.

Status: Approved.

Completion: 1960.

Southern California Gas Co. and **Southern Counties Gas Co. of California,** Los Angeles.

Project: 93 miles of 34-in. from Ivanpah (near California-Nevada border) to Newberry, Calif.

Status: Pending FPC approval.

Completion: 1961.

Project: 115 miles of 36-in. from Newberry to Placentia, Calif.

Status: Under way.

Contractors: **Young & Anderson Co.,** Brea, Calif., has contract for 85 miles from Newberry to Fontana. Contractors for the remainder are **Hood Construction Co.,** Whittier, Calif.; **J. P. Neill & Co.,** Dallas; and **River Construction Corp.,** Fort Worth, Tex.

Completion: August 1960.

Tennessee Gas Pipeline Co., Box 2511, Houston, Tex.

Project: 155 miles of 30 and 36-in. loops in Ohio, Pennsylvania, and New York, and 72 miles of gathering line.

Status: Pending FPC approval.

Project: 21 miles of 16-in. gathering line from Louisiana coast to Block 46 in the Vermilion area.

Status: Pending FPC approval.

Project: 2 miles of 12-in. gathering line from Block 66 to Block 64, East Cameron area, offshore Louisiana.

Status: Pending FPC approval.

Project: 158 miles of 36-in. gas loop at various points between Kinder, La., and Centerville, Tenn.

Status: Approved by FPC.

Project: 41 miles of 30-in. loop east of Hamburg, N. Y.

Status: Pending FPC approval.

Project: 25 miles of 30-in. loop near Kane, Pa.

Status: Pending FPC approval.

Tennessee Gas Transmission Co., Box 2511, Houston, Tex.

★ Project: 11.5 miles of 16-in., 32 miles of 12-in., 9.8 miles of 10-in. off Louisiana coast.

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PIPELINE CONSTRUCTION

Status: Pending FPC approval.
Completion: Fall 1960.

Texas Eastern Transmission Corp., Shreveport, La.
Project: 85 miles of 24-in. from Tamarack, to Perulack, Pa.
Status: Pending FPC approval.
Project: 40 miles of 36-in. from Lambertville, to Linden, N. J.
Status: Pending FPC approval.
Project: 23 miles of 20-in. from Eagle, to Chester Junction, Pa.
Status: Pending FPC approval.
Project: 53 miles of 30-in. from Perulack, Pa., to Lambertville, N. J.
Status: Pending FPC approval.

Texas Gas Transmission Corp., Box 577, Owensboro, Ky.
★ Project: 24 miles of 30-in. south of Bastrop, La., and 56 miles of 12-in. loop in Indiana.
Status: Pending FPC approval.
Completion: Fall 1960.

Transcontinental Gas Pipe Line Corp., Houston, Tex.
Project: 69 miles of 30-in., 269 miles of 36-in., and 7 miles of 16-in. in various states.
Status: Pending FPC approval.
Completion: 1960.

Transwestern Pipeline Co., Houston.
Project: 490 miles of 24 and 20-in. from Texas to Roswell, N. M., and 670 miles of 30-in. from Roswell to Topock, Ariz., near the California border. Also, 300 miles of 10, 12, and 16-in. lateral lines in Texas and New Mexico.
Status: Under way.

Contractors: **Houston Contracting Co.,** Houston, and **H. C. Price Co.,** Bartlesville, Okla., have joint contract to build the main line. Houston Contracting will build 149 miles of 30-in. from Corona, N. M., west to McCartys, N. M.; 55 miles of 30 and 89 miles of 24-in. from Corona east to Roswell and southeast to Carlsbad; 61 miles of 20 and 76 miles of 24-in. from Fort Stockton, Tex., to Carlsbad; and 166 miles of 24-in. from Roswell northeast to Dawn, Tex. Price will handle two main-line spreads totaling 335 miles in Arizona. As for the 300 miles of laterals, Houston Contracting will carry out this work with **R. H. Fulton & Co.,** Lubbock, Tex., and **Western Pipe Line, Inc.,** Austin, Tex.
Completion: June 1960.
Project: 300 miles of 4, 6, and 8-in. gathering lines in the Texas Panhandle, northwestern Oklahoma, Southwest Texas, and southeastern New Mexico. This project is in conjunction with the 1,160-mile Texas-California line (see above).
Contractor: **Sheehan Pipe Line Construction Co., Tulsa.**
Completion: June 1960.

Trunkline Gas Co., Box 1642, Houston, Tex.
Project: 31 miles of 30-in. from Longville to Pitkin, La.; 58 miles of 30-in. from Riverton to Kilbourne, La.; 63 miles of 30-in. from Ballentine, Miss., to Canadaville, Tenn.; 65 miles of 30-in. from Bardwell, Ky., to Marion, Ill.; and 35 miles of 30-in. from Neoga to Bourbon, Ill.
Status: Pending FPC approval.

Project: 140 miles of supply lateral in South Louisiana, including a 17-mile 24-in. loop of an existing lateral and 123 miles of 20, 24, and 26-in.
Status: Pending FPC approval.
Completion: Fall 1960.
Project: 42 miles of 24-in. loop from west of Moss Hill, to Silsbee, Tex.
Status: Under way.
Contractor: **Sharman, Allen, Gay & Taylor, Inc.,** Houston.
Completion: Mid-1960.

Project: 53 miles of 30-in. loop from Pitkin, to Pollock, La.
Status: Under way.
Contractor: **Grayco Constructors, Inc.,** Austin, Tex.
Completion: Mid-1960.
Project: 61 miles of 30-in. loop from Pollock, to Riverton, La.
Status: Under way.
Contractor: **APV Co., Inc.**
Completion: Mid-1960.
Project: 177 miles of 30-in. loops in Louisiana, Arkansas, Mississippi, Tennessee, and Kentucky.
Status: Under way.
Contractor: **Panama, Inc., Houston.**
Project: 62 miles of 26-in. extension from Bourbon to Rossville, Ill.
Status: Under way.
Contractor: **Contracting & Material Co.,** Evanston, Ill.

Union Hill Storage Co., 122 South Michigan Avenue, Chicago 3, Ill.
Project: 2 miles of 4-in. and 7½ miles of 12-in. in the Mahomet field pilot system in McLean, Piatt, and Champaign counties, Illinois.
Completion: June 20, 1960.

United Gas Pipe Line Co., Box 1407, Shreveport 92, La.
Project: 59 miles of 36-in. purchase lateral connecting Bastian Bay field, Plaquemines Parish, Louisiana.
Status: Pending FPC approval.
Completion: Fall 1961.

Canadian Crude Oil Pipelines

Act Oils, Ltd.
Project: A 450-mile line from the Peace River region of northern B. C. to tidewater at Kitimat, B. C.
Status: Proposed.

Bituminous Oil Pipeline Co. (Royalite Oil Co., and Can-Amera Oilsands Development, Ltd.)
Project: A 250-mile line from Athabasca oil sands in northeastern Alberta to Edmonton.
Status: Proposed.

Independent Pipe Line Co. (Home Oil Co.), Calgary.
Project: 1,073 miles of 36-in. from Edmonton, Alta., to Superior, Wis.; 946 miles of 34-in. from Superior to Montreal, Que.; 72 miles of 16-in. and 74 miles of 10-in. feeder lines from Calgary to Bellshill Lake, Alta., on the 36-in. line.
Status: Proposed.

Matador Pipe Line Corp., Denver, Colo.
Project: 175-mile line to carry crude from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man., where it would tie in with the Interprovincial pipeline.
Status: Proposed. Representatives of Western Crude Marketers, Inc., Denver, have been conducting feasibility studies in North Dakota. Matador's application is pending before the Canadian Parliament.
Completion: Tentatively early summer 1960.

Mid-Continent Pipe Lines, Ltd., Edmonton, Alta.
Project: 1,500 miles of 30-in. from Edmonton to Chicago, via Saskatchewan, North Dakota, Minnesota, Wisconsin, and Illinois. U. S. section to be owned by International Oil Pipeline Corp., New York City.
Status: Pending Canadian Board of Transport Commission approval. W. C. Gilman & Co., New York City, has made preliminary study.

Peace River Oil Pipe Line Co., Ltd., Calgary, Alta.
Project: 233 miles of 8-in. to move crude from the Milligan Creek area of British Columbia to Trans Mountain Pipe Line in Alberta. The new line will connect with the Peace River system near Valleyview, Alta.
Completion: Possibly in the fall 1960.
Project: 8 miles of 6-in., 45 miles of 8-in., and 17 miles of 12-in. from its Fox Creek Pump Station to Windfall, Virginia Hills, and Swan Hills fields in Alberta.
Status: Approved.

Producers Pipelines, Ltd., 2236 Albert Street, Regina, Sask.
Project: 18 miles of 3 and 4-in.
Status: Under way.
Contractor: **Banister Construction Co., Ltd.**
Completion: May 30, 1960.

Rangeland Pipe Line Co., Calgary.
Project: 111-mile line from Cessford field to Calgary.
Status: Pending approval of Alberta government.

Trans-Prairie Pipelines, Ltd., Edmonton, Alta.
Project: 6-8-in. line from Weyburn field to Regina and Moose Jaw, Sask.
Status: Proposed.

Canadian Products Pipelines

Britamoil Pipe Line Co., Ltd., Box 130, Calgary, Alta.
★ Project: 126-mile line from Pincher Creek to Calgary.
Status: Pending approval of the Alberta Oil and Gas Conservation Board.
★ Project: 64-mile line from Dick Lake to Edmonton, Alta.
Status: Pending approval of the Alberta Oil and Gas Conservation Board.

Foothills Products Pipe Line Ltd. (Pembina Pipe Line Co., Mannix Co., Ltd.), Calgary, Alta.
Project: 1,300 miles of 16-in. from Alberta to the Great Lakes area.
Status: Proposed.

Hydrocarbons Pipeline Co., Winnipeg, Man.
Project: 800 miles of 6, 8-in. LPG line from near Edmonton to Fort William, Ont.
Status: Has Parliament of Canada approval. Seeking approval of Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board.
Contractor: **Dutton - Williams Brothers, Ltd., Calgary,** and **A. D. Little Co., Boston,** are consultants.

Westalta Products Pipeline, Ltd. (Pembina Pipe Line, Ltd., Edmonton, Alta.).
Project: Gathering system to take natural-gas liquids from plants in Alberta for delivery to proposed trunkline to Great Lakes area.
Status: Pending approval of Alberta Board of Public Utility Commissioners.

Canadian Natural Gas Pipelines

Alberta Gas Trunk Line Co., Ltd., Calgary.
Project: 256 miles of 36-in., 75 miles of 30-in., 55 miles of 26-in., 199 miles of various diameter gathering lines, and 42 miles of 16-in. delivery lateral. Main line is from Berland River, Alta., to Crows Nest Pass.
Status: Approved by the Alberta and Canadian governments. Pending FPC approval.
Project: 65 miles of 24-in., 10 miles of 12-in., 24 miles of 6-in., and 2 miles of 4-in.
Status: Planned.
Completion: 1960.

Alberta Natural Gas Co., Ltd. (Pacific Gas & Electric Co., San Francisco, and Westcoast Transmission, Calgary).
Project: 108 miles of 36-in. across southeastern British Columbia to U. S. border near Kingsgate, B. C.

British Columbia Electric Co., Vancouver.
Project: 35 miles of 30-in. from Huntington, B. C., to Vancouver.
Completion: 1960.

PIPELINE CONSTRUCTION

Canadian Western Natural Gas Co., Ltd., 140 6th Avenue, S. W., Calgary, Alta.

Project: 53 miles of 2 and 3-in. from Alberta Gas Trunk Line to various communities.

Contractor: Company personnel.

Completion: July 1960.

Cartier Gas Corp. (St. Maurice Gas, Inc. and Consumers' Gas Co., Toronto).

Project: 170 miles from Montreal to Quebec City.

Status: Proposed.

Magna Pipeline Co., Ltd., Nanaimo, Vancouver Island, B. C.

Project: 25 miles of 4.85-in. double flexible plastic pipe from Huntington, B. C., to Vancouver Island. It would go under the Straits of Georgia.

Status: Approved by British Columbia Public Utilities Commission. Tentative timetable calls for work to start by spring 1961.

Northern Alberta Pipe Lines, Ltd., Edmonton, Alta.

Project: 110-mile trunk line, plus gathering system, from Lac La Biche, in McMurray vicinity, to Edmonton.

Status: Pending approval of provincial government.

Northern Natural Gas Co., Omaha.

Project: 73 miles of 20-in. from Savanna Creek to Pincher Creek, Alta.

Status: Planned.

Project: 32 miles of 24-in. from Pincher Creek to Montana border to tie in with planned U. S. line on to Minneapolis.

Status: Planned.

Quebec Gas Transmission Lines, Inc., 1610 Sherbrooke St. W., Montreal.

Project: 300-mile line from Montreal to Quebec City.

Status: Proposed.

Saskatchewan Power Corp., 1739 Cornwall St., Regina, Sask.

★ Project: 179 miles of 4, 6, and 8-in., in addition to distribution lines and laterals.

Completion: 1960.

Trans-Canada Pipe Lines, Ltd., Toronto.

Project: 74 miles of 34-in. main-line loop (Burstall to Winnipeg, Man.) and 51-mile 30-in. lateral from Emerson, Man., to U. S. border near Noyes, Minn., to connect with proposed Midwestern system now before U. S. FPC.

Status: To start spring 1960.

Completion: Fall 1960.

Project: An additional 390 miles of 34-in. main-line loop between Burstall and Winnipeg, Man.

Status: Planned. About 268 miles scheduled for construction in 1961, and 122 miles in 1962.

Van Tor Oil & Exploration Co., Vancouver, B. C.

Project: Line from British Columbia mainland to Vancouver Island.

Status: Proposed.

Westcoast Transmission Co., Ltd., Calgary.

Project: (See Alberta Natural Gas Co., Ltd., for joint project).

Project: 250 miles of 30-in. from Taylor to Fort Nelson, B. C.

Status: Planned.

Foreign Crude Oil Pipelines

Arab Pipeline.

Project: 1,250-mile pipeline from the Persian Gulf to Mediterranean serving fields in Saudi Arabia, Kuwait, Iran, Iraq, and Syria.

Status: Proposed by Saudi Arabian Government as project of Arab countries, and approved by the Arab League's petroleum department.

Arabian American Oil Co., Dhahran, Saudi Arabia, and 505 Park Avenue, New York.

Project: 63 miles of 30-in. from Khursaniyah pump station to Ras Tanura.

Status: Planned.

Contractor: Company personnel.

Completion: 1962.

Project: 1¼ miles of 24-in. from Khursaniyah separator plant to pump station.

Status: Under way.

Contractor: Company personnel.

Completion: Third quarter 1960.

Project: 18 miles of 34 and 36-in. from Qatif to Ras Tanura.

Status: Under way.

Contractor: Company personnel.

Completion: Third quarter 1960.

Project: 4 miles of 14-in. from Abqaiq separator plant No. 3 to QA-2 line.

Status: Planned.

Contractor: Company personnel.

Completion: Third quarter 1960.

Barnabos Group (Italian interests).

Project: A line from Venice, Italy, to Innsbruck, Austria, which could then be extended to Munich, Germany.

Basrah Petroleum Co.

Project: 65 miles of 30 and 32-in. from Zubair to Fao in southern Iraq.

Contractor: **Turriff-Burden, Ltd.,** Tulsa.

Completion: 1961.

Bolivia-Paraguay.

Project: 500 miles of 6-in. from Southeast Bolivia to a proposed refinery on Paraguay River, and later to Asuncion.

Status: Planned.

Cie. des Transports par Pipe-lines au Sahara (subsidiary of Cie. de Recherches et d'Exploitation de Petrole au Sahara), Paris.

Project: 420 miles of 24-in. from Edjele fields in Sahara to the Tunisian Mediterranean Coast.

Contractors: **Groupement des Societes Entrepose et Parisienne pour l'Industrie Electrique en vue de l'Etude et de la Construc-**

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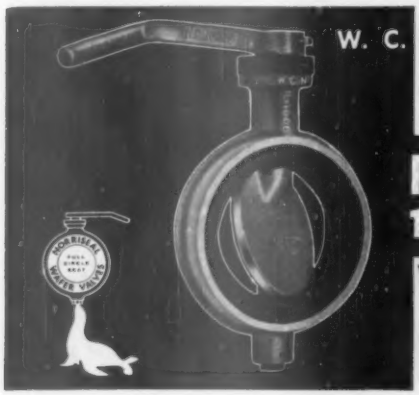

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PIPELINE CONSTRUCTION

tion de Pipe-Lines, and **Ste. des Grands Travaux de Marseille.** Engineering firm on the job is **Bechtel Mediterraneenne S. A.** (subsidiary of **Bechtel Corp.,** San Francisco).

Completion: October 1960.

Creole Petroleum Corp., Caracas, Venezuela.

Project: About 8 miles of 12, 20, and 24-in. gathering line in Lake Maracaibo.

Status: Planned.

Completion: December 1960.

Eastern Block Council for Mutual Economic Aid.

Project: 2,500-mile "Vomecon" pipeline from the Volga-Ural oil fields in Russia to East Germany, Poland, Czechoslovakia, and Hungary. The system will originate at Kuybyshev on the Volga River and will split into two branches at the Dneiper River, one going to Poland and Germany, the other to Czechoslovakia and Hungary. Expected capacity, 300,000 bbl. daily.

Status: Construction under way in Czechoslovakia, with completion of this section by early 1961.

Elburz Oil Corp.

Project: 1,000 miles of 38-in. to move Qum crude to the Mediterranean.

Status: Under way.

ENI (Italian state oil agency) and **Italo-Swiss Finance Co.**

Project: A 700-mile system from Genoa to Aigle, Switzerland, thence northeast to the German border, where it would split with one branch going to Munich and another branch to the Karlsruhe area. Feeder lines would go to Turin, Milan, and Cremona, Italy.

Status: The trunk line from Genoa to Aigle has been approved by the Italian Government.

Esso Libya.

Project: 100 miles of 30-in. from Zelten field to the Mediterranean Coast.

Status: Pipe ordered. Route and terminal location not yet established.

Iranian Oil Participants, Ltd.

Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bander Mashur line.

Status: Planned.

Project: 99 miles of 26, 28, and 30-in. from Gach Saran field to new terminal at Kharg Island in the Persian Gulf.

Contractor: A joint venture of **Raymond Concrete Pile Co.** and **Williams Bros. Co.,** Tulsa, **Richard Costain, Ltd.,** and **John Brown, Ltd.,** London and **Werkspoor & Bredoro,** The Netherlands.

Iraq Petroleum Co., Ltd., 214 Oxford Street, London, W. 1, England.

Project: 44 miles of 32-in. in Iraq., 21 miles of 24-in. in Syria towards Banias, and 38 miles of 30-in. in Syria and Lebanon toward Tripoli.

Status: Under way.

Israel Government.

Project: Replace 125 miles of 8-in. from Elath to Beersheba with 16-in.

Status: Under way.

Completion: June 1960.

Kuwait Oil Co., Ltd., Burgan House, 105 Wigmore Street, London W. 1, England.

Project: 20 miles of 6-in. Minagish transit line.

Status: Under way.

Completion: May 1960.

Oil India Private Ltd. (Burmah Oil Co. and Assam Oil Co., two-thirds, and India Government one-third).

Project: 720 miles of line in northeast India. This would include 260 miles of 16-in. from Nahorkatiya to Noonmati (site of proposed refinery), and 460 miles of 14-in. from Noonmati to Barauni (site of another proposed refinery).

Contractors: **Mannesmann,** a German firm, will lay the 260-mile 16-in. system. **Stewarts & Lloyds,** London, is supplying 32,000 tons of pipe for the project. Contract for the 460-mile 14-in. line has been awarded to **Hindustan Steel, Ltd.** Mannesmann is build- a steel mill at Rourkala for the company.

Completion: The 16-in. system is scheduled for completion in March 1961.

Petrofina, S. A., 31 Rue de Loi, Brussels, Belgium.

Project: 3-in. line from Galinda field to Bon Jesus, and 4-in. line from Bon Jesus field to a pipeline connecting Benfica field and Luanda, Angola, where Petrofina operates a refinery.

Status: Under way.

Completion: First half of 1960.

Petroleo Brasileiro S. A. (Brazil).

Project: 35 miles of 8 to 12-in. pipe from Buracica to Candeia.

Contractor: **Techint, Inc.,** Milan, Italy.

Project: 80 miles of 24-in. to tie in to proposed Caxias refinery near Rio de Janeiro.

Status: Planned.

Rotterdam-Rhine Pipeline Co. (N. V. Rotterdam-Rijn Pijpleiding Mij., owned 40% by Royal Dutch-Shell, 20% by Caltex, and 40% by Galsenberg & Mobil Oil Sales & Distribution Co.)

Project: 183 miles of 24-in. from Pernis, the port of Rotterdam, extending to Venlo, Holland, where it branches into one line to Wesel and a second to Godorf and Wesseling, Germany. The branch to Wesel connects with a 16-in. line to Gelsenkirchen.

Status: Under way.

Contractors: **Bechtel International Co.** is construction manager of the project which is being constructed by a group of Dutch and German contractors.

Completion: June 5, 1960.

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PIPELINE CONSTRUCTION

Royal Dutch-Shell.
Project: 12-mile line from Gore Bay, Australia, to Royal Dutch-Shell's Clyde refinery.
Status: Planned.
Project: 161 miles 20-in. line from Tandzung field to Balikpapan refinery, Borneo.
Status: Planned.
Contractor: **Williams Brothers Overseas, Ltd.,** Tulsa, and **John Brown, Ltd.,** London.
Completion: January 1, 1962.

Shell-BP Petroleum Development Co. of Nigeria, Ltd., 38/39 Marina, Lagos, Nigeria.
Project: 18 miles of 12-in. line from Port Harcourt to port facilities under construction at Bonny, Nigeria.
Status: Under way.
Constructor: **African Construction Co.**

South European Pipeline Co. (Jersey Standard, Caltex, Shell, British Petroleum, and 12 other firms.)
Project: 419 mile 30-in. line from Lavers, near Marseille, to Strasbourg, with 40-mile extension to Karlsruhe, Germany.
Status: Construction to get under way by January 1961.
Completion: 1962.

Superior Oil Co., Los Angeles.
Project: A 16 and 24-in. line from its Lake Maracaibo, Venezuela, production to shore.
Status: Planned.
Contractor: **Pipe Line Technologists, C.A.,** Maracaibo, has design.

Syrian Pipeline, Damascus.
Project: 500-mile line from Karshuk field, Syria, to Mediterranean.
Status: Proposed.

Union of Soviet Socialist Republics.
Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa and Tuimazy fields in Bashkiria to Irkutsk near Lake Baikal.
Status: Under way.
(See Eastern Block for information on new East Europe line).

Yacimientos Petroliferos Fiscales (Argentina), Buenos Aires.
Project: 390 miles of 14-in. from fields in Neuquen Province, Argentina, to Bahia Blancha on the coast.
Status: Bids requested.
Project: 625 miles of 12-in. from Mendoza to San Lorenzo.
Status: Planned.

Yacimientos Petroliferos Fiscales Bolivianos, La Paz.
Project: 407-mile 12-in. line from Camiri to Sica Sica.
Status: Planned.

Foreign Products Pipelines

Arabian American Oil Co., Dhahran, Saudi Arabia, and 505 Park Avenue, New York.
Project: 30 miles of 8-in. LPG line from Abqaiq to 'Ain Dar.
Status: Planned.
Contractor: Company personnel.
Completion: 1961.

Esso Petroleum Co., Ltd., 36 Queen Anne's Gate, Westminster, London, S.W. 1, England.
Project: 70-mile ethylene line from the Fawley refinery to a new petrochemical development at Severnside.
Status: Planned.

Estrada Ferroviaria Santos a Jundial, Sao Paulo, Brazil.
Project: 25 miles of 6-in. ethylene line from Cubatao to Rio Grande.
Status: Pending approval.
Contractor: **Techint, Inc.,** Milan, Italy.

Kuwait Oil Co., Ltd., Burgan House, 105 Wigmore Street, London W. 1, England.
Project: 5½ miles of 12-in. to return product to reservoir.
Completion: Summer 1960.
Project: About 2½ miles of 8 and 12-in. at Shuwaikh depot.
Status: Under way.
Completion: Summer 1960.

National Iranian Oil Co., Teheran.
Project: 510 miles of 8-in. eastward from Teheran to Meshed, Iran.
Status: Under way.
Contractor: **Williams Brothers,** Tulsa, has contract for about half this project.

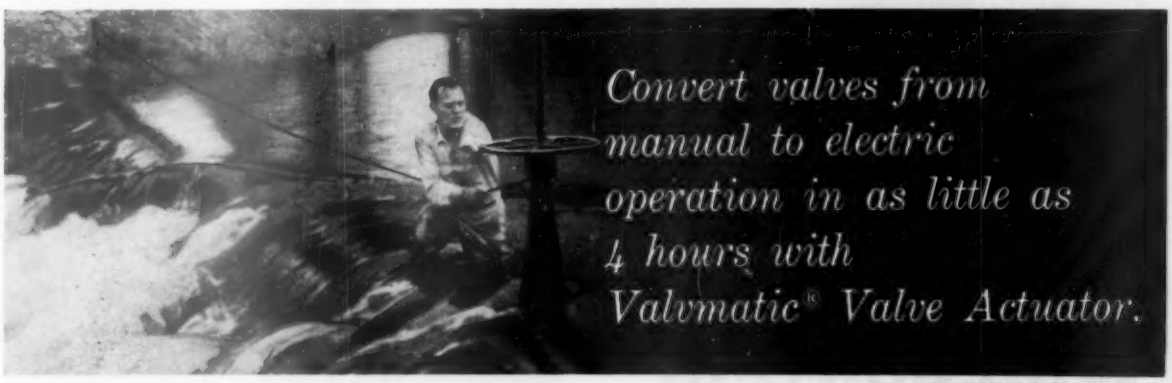
North Atlantic Treaty Organization (Bid details from Bureau of Foreign Commerce, U. S. Department of Commerce, Washington).
Project: 57 miles of 8-in. in Germany to the connection to Buenos Aires.
Status: Planned.
Project: 93 miles of 6-in. in Land Baden-Wuerttemberg air field.
Status: Planned.
Project: 291 miles of 8-in. in Turkey.

Petroleos Mexicanos.
Project: 291 miles of 8-in. from Torreon to Chihuahua.
Status: Planned.
Completion: March 1961.

Pipelines of Puerto Rico, San Juan.
Project: 95 mile 8-in. line from Commonwealth Oil refinery at Penuelas to Catano in the vicinity of San Juan.
Status: Approved by Puerto Rican Public Service Commission.

Syrian Pipeline.
Project: About 310 miles from a new refinery at Homs to tank farms in the Damascus, Aleppo, and Latakia areas.
Status: Bidding deadline past.

Union of Soviet Socialist Republics.
Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa and



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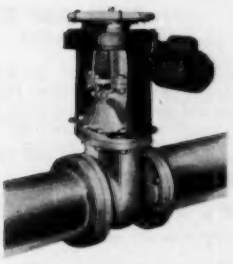

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PIPELINE CONSTRUCTION

Tuimazy fields in Bashkiria to Irkutsk near Lake Baikal.

Status: Under way.

Project: 700 miles from Novo-Kuibyshev refinery at Kuibyshev on Volga River to Bryansk in western Russia.

Status: Under way.

Yacimientos Petroliferos Fiscales (Argentina), Buenos Aires.

Project: 652 miles of 10-in. from Lujan de Cuyo to Buenos Aires.

Status: Planned.

Foreign Natural Gas Pipelines

Arabian American Oil Co., Dhahran, Saudi Arabia, and 505 Park Avenue, New York.

Project: 15 miles of 14 and 16-in. from Abqaiq separator plant No. 3 to AD-1 line.

Status: Planned.

Contractor: Company personnel.

Completion: 1961.

Creole Petroleum Corp., Caracas, Venezuela.

Project: 18 miles of 30-in. and about 13 miles of 8 to 24-in. from stations in Bachaquero area to the Bachaquero compressor plant.

Status: Under way.

Completion: October 1960.

Project: 22 miles of 12-in. from conservation plant Bachaquero 1 at Lake Maracaibo to conservation plant Tia Juana 2.

Status: Under way.

Completion: June 1960.

Gases Naturales de Colombia, S. A. (owned 50% by Colombian Petroleum Co., which is affiliated with Mobil International and Texaco, and 50% by local interests).

★ Project: 140 miles of 10-in. from Cicuco field to the Caribbean port of Barranquilla.

Completion: Late 1961.

Israel Government.

★ Project: 18 miles of 6-in. from Rosh-Zohar field to Sodom.

Completion: About July 1, 1960.

★ Project: 75 miles from Rosh-Zohar field to Ashdod Yam.

Status: Proposed.

Iraq Government.

Project: A natural-gas line from Rumaila oil field to Basrah.

Mene Grande Oil Co., Caracas, Venezuela.

Project: 19 miles of 12-in. from East Soto to Zapatos.

Completion: 1960.

Pakistan Petroleum Co.

Project: 145 miles of 8-in. high-pressure line from Sylhet field to Daccq, East Pakistan.

Status: Proposed.

Petroleos Mexicanos.

Project: 483 miles of 24-in. from Jose Colomo field in State of Tabasco to Mexico City.

Status: Under way.

Contractors: **Condusa** is contractor. Contracts for eight river crossings on the projects were awarded to **Collins Construction Co.,** Port Lavaca, Tex., and **Constructora Inde S. A. de C. V.,** Mexico City.

Completion: November 1960.

Project: 200 miles of 14-in. from Mexico City to Salamanca.

Status: Planned.

Completion: September 1961.

Project: 291 miles of 12-in. from Torreon to Chihuahua.

Status: Planned.

Completion: March 1961.

SN Repal.

Project: 327-miles of 24-in. from Hassi R'Mel gas field in Algeria to the Mediterranean ports of Algiers and Oran.

Contractor: **Groupement Entrepose - Ste. Parisienne pour l'Industrie Electrique (GREP)** has contract for 200 miles from Hassi R'Mel to Tiaret.

Standard-Vacuum Oil Co., New York.

Project: 60 miles of 8-in. from Radja field to proposed ammonia plant near Palembang, Sumatra.

Status: Planned.

Completion: Ammonia plant is scheduled for completion in 1962.

Union of Soviet Socialist Republics.

Project: Two parallel, 40-in. lines, each over 1,300 miles long, from Gazli, near Bukhara, northward to Sverdlovsk and Chelyabinsk.

Status: Planned.

Project: Line from Samarkand through Tashkent to Chimkent, Dzhambul, Frunze and Alma-Ata near Chinese border.

Completion: Line from Samarkand to Tashkent expected to be finished in 1960. Completion of rest of line expected by 1965.

Project: Line from Berezovo field southward to Sverdlovsk.

Status: Proposed.

Project: 438 miles from Dashava in Carpathian Mountains to Minsk.

Status: Under way.

Completion: 1960.

Project: Line from Minsk northward to Baltic Sea area.

Completion: To Vilnius, Lithuania, in 1961; to Riga, Latvia, in 1962.

Project: Line from Minsk northeast to Leningrad.

Status: Proposed.

Project: 405 miles from Saratov north to Gorki via Penza.

Status: Under way.

Completion: 1960.

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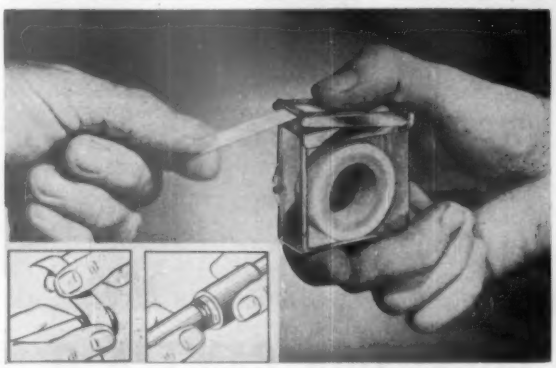
An advantage for operators is the unobstructed vision forward over the tractor because of the loader's diagonal side-bracing. An indicator lets the operator know the bucket position without guess work. Delivery: immediate. Source: **Tractor and Implement Div., Ford Motor Co., Birmingham, Mich.**

LIFT CAPACITY of this loader is 2,500 lb., and breakaway capacity is 5,500 lb. It fills any standard-size dump truck from either side.



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Diesel-powered, the ditcher weighs 36,000 lb. The vertical boom operates on the principle of moving a chain of linked buckets at high speed. Each bucket is designed to be self-cleaning. The controls are designed for easy one-man operation. The machine is equipped with power steering and hydraulic brakes. Source: **Barber-Greene Co., 400 North Highland Avenue, Aurora, Ill.**

Meter proving

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To prove a meter, the tachometer is installed directly on the meter and the manifold valves are positioned so line fluid flows into the calibrated pipe behind the piston. The tachometer may be equipped to generate 1,000, 10,000, or 100,000 pulses per barrel of throughput.

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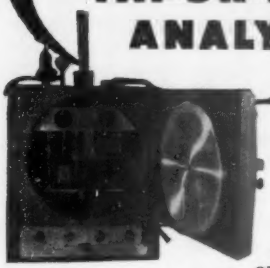

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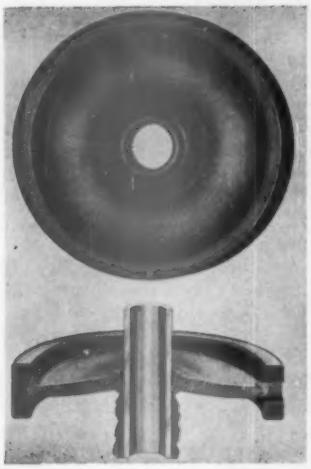
SOUTHWEST PLANT: GARLAND (DALLAS COUNTY), TEXAS



Wiping pressure

. . . is kept constant on drill pipe with a new all-rubber pipe wiper, the Magic Circle, even after miles of pipe have passed through, the maker claims. The wiper has a relatively deep structure and can be reversed after one side has become worn to provide a new wiping surface.

A recessed bowl design keeps the wiping lip out of the master bushing, and a tapered inner-circle design allows stretch to occur at the outer diameter during wiping, enabling the wiping lip to maintain compression on the drill pipe throughout the service life of the wiper. Three ports located at the outer diameter of the wiper allow drainage while keeping foreign objects, such as tong dies, from passing through. The pipe wiper is available in sizes from 9 to 17 in. o.d. to fit all sizes of rotary tables. Approximate price, f.o.b. factory: from $12.50 for a 9-in. to $37.50 for a 17-in. size. Source: **Oil States Rubber Co., Arlington, Tex.**

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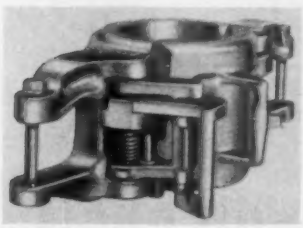

Side-door elevators

. . . are now available for use with Reed Super Connector drill collars. The Type HD-50 and 150 elevators are obtainable in a wide range of drill-collar sizes and in 50 and 150-ton capacities, respectively.

Reed field-replaceable drill collar connectors are supported by these elevators at the drill-collar recess. The elevator top bore is machined for this purpose, and a larger bottom bore permits freedom of the drill collar o.d. below the recess.

A patented safety latch automatically locks when the elevator door is latched. With this door open, the elevators ride perfectly level. Source: **Web Wilson Oil Tools, Inc., Box 72096, Los Angeles 2.**

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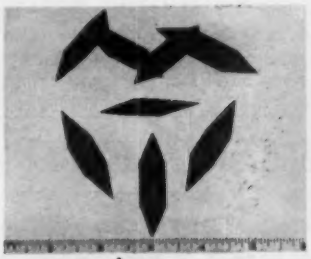

Lost-circulation

. . . aid just disclosed is a bridging agent made in the form of wedge-shaped plugs. The bridging agent offers a way to greatly increase sealing in extra-large fractures.

Called a Masterplug, it is used with a lost-circulation sealer. It mixes readily and pumps easily through conventional mud pumps. The bridging agent

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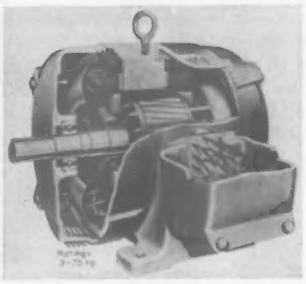
is highly efficient in bridging because each plug jams against the next plug. Average plug length from point to point is 2 in. Source: **Masterseal Co., Box 1501, Ventura, Calif.**

●

New motor

. . . for oil-field pumps recently developed is a squirrel cage type that comes in ratings of 3 to 75 hp. The Life-Line A motor, according to the maker, provides high performance over a wide voltage range. It has a low magnetizing current to assure a high power factor even at overvoltage. Its high starting torque promises



to provide positive "breakaway" even on low voltage under severe conditions.

Both the stator and rotor are designed to handle short-time overloads. Temperature rating is 10° C. below the maximum values of industry-accepted standards. Other features to note: (1) baffling in both brackets for protection against rain and sleet, (2) cast-iron frame and brackets and gasketed conduit box for corrosion resistance. Too, the insulating varnish is a silicone-fortified thermosetting type for protection against moisture, crude oil, and dirt.

According to the maker, the hardware has a special moisture-resistant finish that withstands a controlled salt-spray attack for 96 hours. Delivery: immediate. Approximate net price, f.o.b. factory: from $130 for a 3-hp. to $1,532 for a 75-hp. motor. Source: **Westinghouse Electric Corp., Box 2099, Pittsburgh 30.**

●

Newest tank valve

. . . on the market is a 3-in. valve that is not clogged with parts or partial openings. The valve has a 15-in. penetration inside the tank so that that much ice could form inside the tank and the valve still operate.

The valve is made principally in all-brass, which consists of a solid-brass body with all brass working parts, except the cutoff plug and cam-rod seal. These are of neoprene.

According to the maker, when the valve is in the off position, no water is in the valves, which prevents freezing. It serves as an automatic check valve when in use as an inlet valve. It operates from the fully closed to the fully open position in less than one-half turn. To install the valve, simply remove the present tank nipple and install the valve in its place. Source: **AHP Mfg. Co., 727 South Spruce, Wichita.**

●

Dacron hose

. . . of two types is now on the market, multiple-woven and double-jacketed, in diameters from 1½ to 6 in., lengths of 50, 75, and 100 ft., and for pressures up to 600 psi.

The all-Dacron hose offers a number of advantages over older types, such as more resistance to abrasion and chemicals, lightweight, and flexibility.

The Dacron yarn is rated stronger than cotton yarn. Thus smaller Dacron cords can be used in hose construction for the same strength. Also, the yarn does not support mildew or other destructive fungi. Delivery: 30 days. Approximate list price, f.o.b. factory: from $90 for 50 ft. of coupled 1½-in. to $440 for 50 ft. of uncoupled 6-in. hose. Source: **Eureka Fire Hose, Div. of U. S. Rubber Co., 1 Market Street, Passaic, N. J.**

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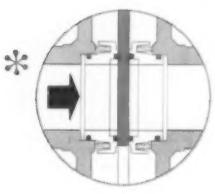
Marvin Grove talks to pipeliners—

THE HEART OF OUR VALVES IS RIGHT HERE



The hoop ribs help you spot a Grove G-4 pipeline valve a mile away. But the heart of this valve is its exclusive *'protected Seal-"O"-Ring'*® system. We have designed outer and inner metal seat rings that shield the o-rings on each side of the gate from damage by bore contaminates. The inner seat rings also function as a primary metal-to-metal seal backed up by the o-rings. And to assure fast, easy open and close, the inner metal rings scrape foreign matter off the gate while the o-rings squeegee it clean. Protected o-rings, metal-to-metal seal, self cleaning—plus no lubrication ever, have made Grove a leader in pipeline valves.

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SHOWCASE . . .

New Equipment

Meter measures

. . . slow flows such as the amount of makeup lubricating oil for engines or diesel fuel used. The Ren slow-flow meter is a positive-displacement type for use with the maker's oil-level regulator for metering the amount of lubricating oil fed by the regulator to engine crankcases and lubricators.

The meter embodies a pressure regulator which permits it to operate from a supply system of 2 to 40-psi. pressure. The counter registers in gallons and tenths. Source: **Power Plus Corp., 4462 East Washington Boulevard, Los Angeles.**

●

Continuous core

. . . taken by this rig to the full depth of the hole using reverse circulation in conjunction with a core bit and a dual drill-pipe string which is rotated by a power swivel, the maker claims. Cores with a 2-in. diameter and 6 in. long are circulated to the surface through the core tube and onto the shale shaker where they are retrieved and placed in trays, according to the maker.

The portable rig and drilling method, according to the maker, (1) provide accurate evaluation of the entire lithological interval, (2) aid in the search for stratigraphic traps and other structural phenomena, (3) reduce hydraulic surface requirements, (4) minimize lost circulation conditions, and (5) minimize crooked-hole problems. Source: **Strato-Drill, Inc., 828 South Seventy-fifth, Houston 23.**

●

New welding steels

. . . have been developed for pipelines that incorporate columbium into a new approach to high-strength steel chemistry. Outstanding feature of the new steels is their weldability for cold-weather pipeline installation.

Trade-named GLX-W steels, they are weldable during subzero temperature, without need for prewelding preparation or special welding techniques. The steels come in guaranteed minimum yield strengths of 45,000 to 60,000 psi. According to the manufacturer, their ability to be bent and formed to follow the path of pipeline ditches is comparable to that of presently used high-strength pipe steels.

A GLX-W (45,000 psi.) grade has already been fabricated into 5 miles of 24-in. pipe and installed into a high-pressure natural gas line in Texas. Source: **National Steel Corp., Grant Building, Pittsburgh 19.**

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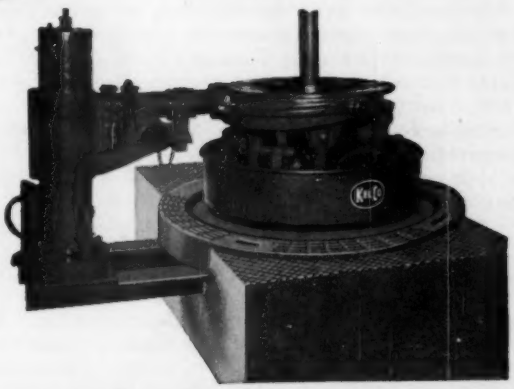
BREAKOUT AND SPINNING LINE CATHEADS

KELCO AIR OPERATED POWER SLIPS



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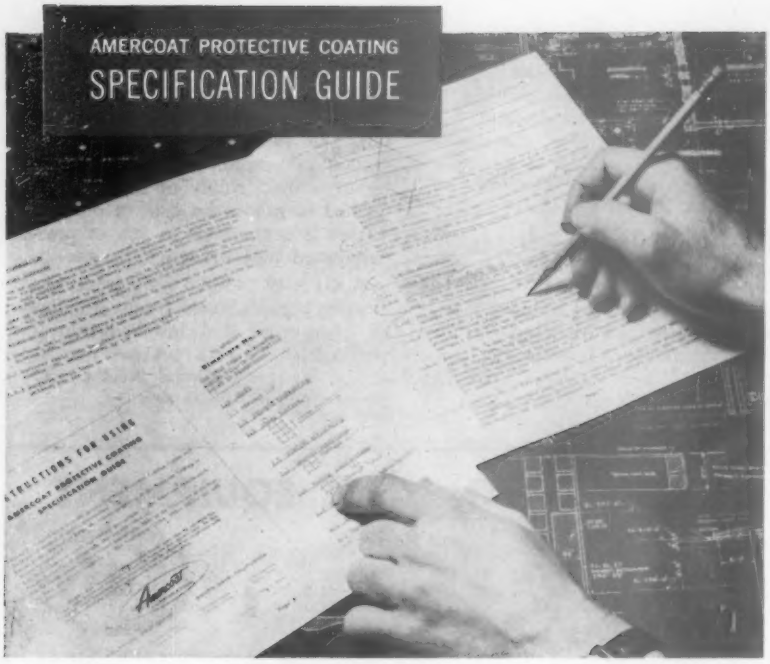

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Tight, comprehensive specifications are the beginning of a successful protective coating application. Unless specifications are complete and detailed, costly failures or confused, inaccurate bidding can result.

Now, engineers who write specifications for protective coating applications can insure complete, accurate specifications through use of the new Amercoat Protective Coating Specification Guide.

The Guide is based on recognized best practices in the industry, such as Steel Structures Painting Council Specifications, and contains paragraphs covering all phases of coating application from surface preparation to inspection.

In use, appropriate paragraphs in the Guide are selected according to the coating to be used and the condition involved. At this step, your Amercoat Sales Engineer will be pleased to cooperate with you in deciding upon the most effective coating or coating system for the job requirements. The finished specifications can then be copied by a typist.

Use of the Amercoat Specification Guide assures tight specifications that spell out every step necessary to eliminate confusion when the contractor bids and to insure a satisfactory application later. Job delays and extras are reduced or eliminated and a well applied coating job is assured.

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SHOWCASE . . .

New Literature

Refraction seismograph system

. . . which is portable is described in a newly published illustrated publication. The Model P-19 system features frequency characteristics which render the system valuable for conventional refraction uses, well-velocity surveys, and overburden determinations. Source: **Southwestern Industrial Electronics Co., 10201 Westheimer Road, Houston 27.**

Corrosion-test-sample

. . . availability is explained in new 4-page Bulletin 981 now available. It details types of samples, construction materials, and recommended testing procedures. Samples available include Glasteel disks, test cups and dumbells, as well as tabs of tantalum, titanium, zirconium, Hastelloy alloys, stainless steel, and other metals and alloys. Source: **Pfaudler Co., 1106 West Avenue, Rochester, N. Y.**

Hi-Seal tube fittings

. . . publication, packed with vital technical data, contains over 250 new styles and sizes. Obtainable for the asking, Catalog 3108 offers sections on pressure, vacuum, temperature, vibration, corrosion resistance, port seals, flow, and velocity characteristics, along with laboratory reports and complete assembly instructions.

Styles, sizes, and materials of stock items are listed in an easy-to-follow manner with complete dimension data on each type. Listing includes assorted fittings, valves, hose couplings, and a special filter tee for continuous gas analyzation in chemical plants, refineries, hydraulic work, and pneumatic systems. Source: **Imperial Brass Mfg. Co., 6300 West Howard Street, Chicago 48.**

Heat-exchanger

. . . selection-data form is now available to help you obtain precise information regarding the most efficient size and type of heat exchanger required for a particular operation. The form is designed so that you can conveniently supply basic information by answering a few questions regarding the type of application and the fluid to be heated, cooled, or both.

With this information, Air Preheater engineers will analyze the heat-transfer problem and recommend

alternate solutions that might be followed. Source: **Air Preheater Corp., 60 East Forty-second Street, New York 17.**

Plastic-properties

. . . table shows significant physical, electrical, chemical, and optical properties of nine thermoplastic materials. Materials covered are acrylics, acetate, butyrate, Teflon and Kel-F fluorocarbons, nylon, polyethylene, and vinyls.

Properties shown include: tensile, impact, flexural and compressive strength; resistance to sunlight, water, weak and strong acids and alkalies; dielectric short-time strengths and constants; power factors; machining qualities, hardness, flexibility, and thermal properties. Source: **Cadillac Plastic & Chemical Co., 15111 Second, Detroit 3.**

Equipment catalog

. . . EWB/5 has just been issued and is being offered free upon request. Tab-indexed, the catalog contains individual sections on truck tanks, loading equipment, swing joints, floating suctions, parts and maintenance, and engineering data. The publication is packed with photographs, line drawings, applications, specifications, features, and information data. Source: **Emco Brass Mfg. Co., Ltd., Westwood, Margate, Kent, England.**

Analyzers

. . . for hydrogen and fluorine compounds are detailed in a new 2-page product-data sheet now obtainable. It covers the Model 104 hydrogen analyzer, Model 105 fluorine analyzer, and Model 106 hydrogen and fluorine analyzer.

Specifications and typical analysis charts are included. One section is devoted to fluorine determinations in semimicro amounts as part of a solid-propellants program. Source: **Ridgefield Instrumentation Div., Schlumberger Well Surveying Corp., Ridgefield, Conn.**

Controlled-volume

. . . pump requires no other openings in the tank except for the one at the top, no bottom connections, and no external leakage, as described in new Bulletin 1153-c. This results because of the Mersemetric pump's submerged liquid end. The 4-page literature gives details and illustrations of the pump, designed for pressures to 1,200 psi. with an accuracy of better than 1%. Source: **Milton Roy Co., 1300 East Mermaid Lane, Philadelphia 18.**

Industrial-diamonds

. . . booklet describes the customer-oriented approach of a newly formed Engelhard division and outlines several facets of the division's program for industrial-diamond purchasers. Frankly discussed from the diamond purchaser's viewpoint are availability, reduced investment requirements, product offering, customer-service technical assistance, sales development and market-development capabilities, and the over-all organizational setup to provide purchasing convenience. Source: **Engelhard Industries, Inc., 113 Astor Street, Newark 2.**

Safety tools

. . . which are nonsparking are described in a catalog recently revised and brought up to date. Newest additions to the 24-page illustrated catalog include: two sizes of Channelock pliers, a small adjustable-end wrench, several styles of air-hammer chisels, and 18 sizes of Allen wrenches. Source: **Ampco Metal, Inc., P. O. Box 2004, Milwaukee 1.**

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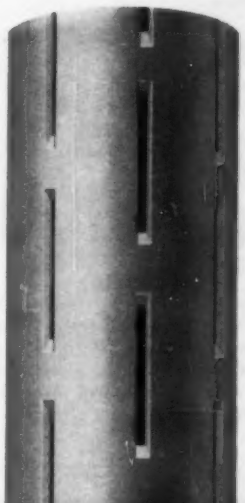
...AT HOME AND ABROAD
EMSCO



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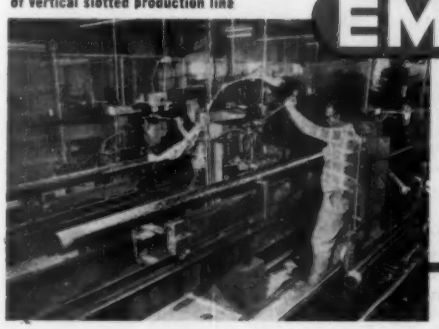
View in Houston, Texas, shops of vertical slotted production line



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▶ ▶ ▶ Equipment Men Notes

George W. Henderson becomes

. . . branch manager of the Houston oil-field-equipment division of Delta Tank & Mfg. Co., Inc. Henderson, who joined Delta 3 months ago, was formerly engaged in petroleum-equipment sales activities for more than 7 years.

S. M. Jones Co. appoints two

. . . factory sales representatives for sucker rods, according to Lockett J. Pundt, general sales manager. Leonard Tucker, who has worked for oil-field-supply firms over the past 13 years, will cover the Gulf Coast area with headquarters in Houston. Bob S. Lee, also an experienced supply man, will reside in Odessa as an addition to Jones personnel in that district.

O. L. Olsen Co., Inc. moves

. . . into new and expanded quarters in Houston's Baldwin Building. The office facilities are expected to provide growth space for the company's engineering and administrative sections.

The Olsen operation provides for the handling of any project on a "solely responsible packaged service" plan which encompasses all construction phases from process design, engineering, drafting, and construction through operation startup. The firm has constructed more than 100 projects in 15 years, the majority of which have been gas-processing plants.

Four sales engineers are named

. . . as area representatives for Union Switch & Signal Division of Westinghouse Air Brake Co. The announcement comes from T. C. Schroeder, product manager, systems, of the general apparatus department.

G. M. DuBois

R. J. Cook

W. F. Haley

J. H. Stelloh

Gerald M. DuBois takes over in the eastern area; Robert J. Cook, midwestern area; William F. Haley, southwestern area; and James H. Stelloh, in the western area. DuBois will also act as area representative for the division in Canada.

Tube-Kote, Inc. reports

. . . two major personnel changes in its Louisiana division. Henry C. King is the new manager of the Harvey plant, and Fred F. Gafford becomes area representative. King was the former sales representative for the area, and Gafford was vice president and treasurer of Bagwell General Steel Co.

Homco opens service branch

. . . in Bay City, Tex. to provide fishing and cutting tools and electrical well services. Harry Bish has been named district manager. Joe Herrington and Virgle (Bevo) Bevers have been assigned as fishing-tool supervisors for this branch of Houston Oil Field Material Co., Inc. James Peppard will serve as warehouseman and office man.

Brown Oil Tools, Inc. opens

. . . a new store in Beaumont under the supervision of W. M. Fitzgerald. The store will maintain a complete line of service and production equipment.

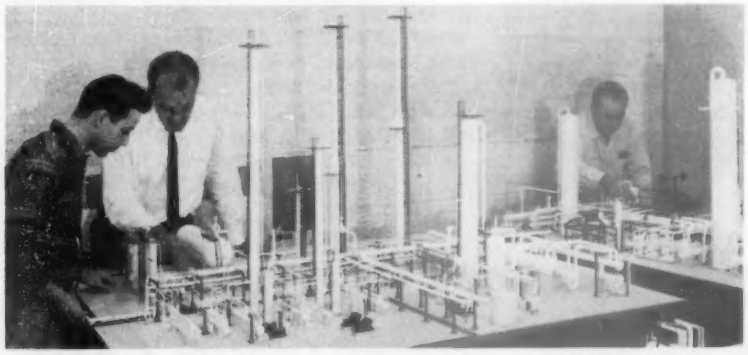
Grant named training supervisor

Harold Grant

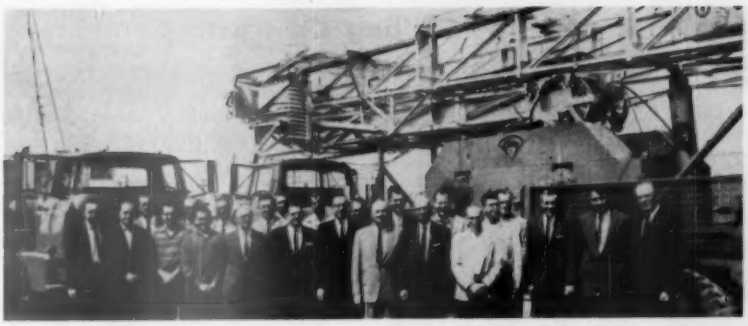
. . . for Halliburton Oil Well Cementing Co.'s southern region, consisting of the Corpus Christi, Houston, New Orleans, and Shreveport divisions. A Halliburton employe since 1940, Harold Grant most recently was district superintendent for Houston field locations. In his new post Grant replaces D. J. Sargent who is now assistant manager for the company's New Orleans division.

V. C. Horner assumes position

. . . as operations manager of the Jet Process section of Borg-Warner Corp.'s Byron Jackson Division. Horner, former sales manager of Byron Jackson Tools, Inc., most recently served as general manager of BJ Electronics, Santa Ana, Calif.



MODERN MODEL SHOP of Delta Engineering Corp. in Houston contains equipment for producing scaled, detailed models of plant designs. Three Delta engineering-draftsmen are assigned to the project under the direction of Lee Trentham, vice president. Trentham noted that customers have been very enthusiastic about this new phase of Delta's operation because it offers the advantages of optimizing a plant layout and piping systems and thus minimizing detailed drafting. This results in cost savings relating to drafting time and materials used. The company has announced completion of a 50% expansion program to take care of an increase in workload. At the same time personnel in engineering, drafting, designing, accounting, and stenographic have been added in this second physical expansion by Delta in 7 years.



SALES AND SERVICE CONFERENCE held recently at the home office of Fred E. Cooper, Inc., Tulsa, was attended by Cooper sales, service, and branch personnel from the United States and Canada. Present at the 5-day event were, front row, left to right: Kenneth Flett, H. R. Pattison, Fred Buchanan, Clifford Holley, Ray Kaib, Bob Summers, Earl Woolbert, Harry Farmer, A. L. Oliver, Bill Wickham, Jack Barnes, Jake Jacobsen, H. R. Kramp, and J. W. Allen. In the second row, from left, are: Ralph Sessing, Joe D. McKay, John Jacobsen, Joe Williamson, Jim Gobel, Charles Leonard, Bill Raney, Jim Toombs, Bernie Maslanka, and Al V. Honstain.

Jack D. Tolliver is promoted

. . . to the newly established position of field sales manager of Chemetron Corp.'s Tube Turns Division. Promotion from his post as eastern regional sales manager expands Tolliver's duties to include supervision of sales in all United States district-office territories.

The new field sales manager joined Tube Turns in 1949, became manager of sales development when that department was organized in 1955, and was named sales manager for the eastern region in 1958.

Tom Lindholm is appointed

. . . executive vice president of Photogravity Co., Inc., according to Ed Haye, president. Previously Lindholm was in charge of California Co.'s gravity and magnetics department.

Tom Lindholm

Ed Haye

Lindholm was employed by Standard Oil Co. of Texas in 1952. He did subsurface exploration and seismic work in West Texas and Oklahoma before leaving to join California Co.

Wilson Supply Co. names

Paul Hansen

. . . Paul Hansen as regional manager for its International Division. He will work out of the Houston office with Wayne Harris, head of Wilson Supply International's Latin American sales operations. Hansen goes to Wilson from ITEC S.R.L., Buenos Aires, where he had been sales manager of the company's oil-field supply operations. Earlier he spent 5 years in North Africa working for a Swedish drilling company.

Midwest Piping Co., Inc. opens

. . . an office in Tulsa for sales of welding fittings, piping fabrications, and erection in an area comprising Oklahoma, Arkansas, and Northwest and West Texas. Earl B. Marrs has been appointed office manager. Associated with Walworth Co. for 20 years, Marrs most recently was manager of that company's Tulsa sales office.

National Supply Co. appoints

. . . Dominion Oilfields Supply Co., Ltd., of Calgary, as distributor in Canada. The company will handle National Supply's full line of oil-field machinery and equipment, together with certain products of other manufacturers that are often used with National equipment. Dominion has stores at Calgary, Drayton Valley, Swan Hills, and Edmonton, Alta.; at Estevan, Sask.; and at Fort St. John, B. C.

Distribution through Dominion will be in addition to that through National Supply Co., Ltd., which also has headquarters at Calgary. National's stores are at Calgary, Drayton Valley, Edmonton, Stettler, Whitecourt, and Estevan.

Two new operating divisions

. . . are formed by Manning, Maxwell & Moore, Inc. Philip T. Tryon has been named general manager of the new Gauge & Instrument Division, and Clyde E. Dephouse general manager of the Valve Division. Tryon was formerly a plant manager and Dephouse was manager of industrial planning.

AWARDED CONTRACT to build a high-speed electronic analog computer is R. C. Sweet (left), of Sweet Instrument Co., Houston. The contract was awarded by Lynn W. Brasher (right), and Weaver W. Adams (center), executives of Geophysical Analog Research Corp., Houston. The computer—first of its type designed and built specifically for use in exploration geophysics—will be used to solve complex geophysical problems related to the delineation of oil or gas-bearing subsurface structures. The corporation will use the instrument in various phases of exploration activities.

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The Industry's Finest Valve

For mud lines, sand-frac, cementing and other water, oil or gas services.

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2,000 lbs. W.P. (4,000 lbs. test)
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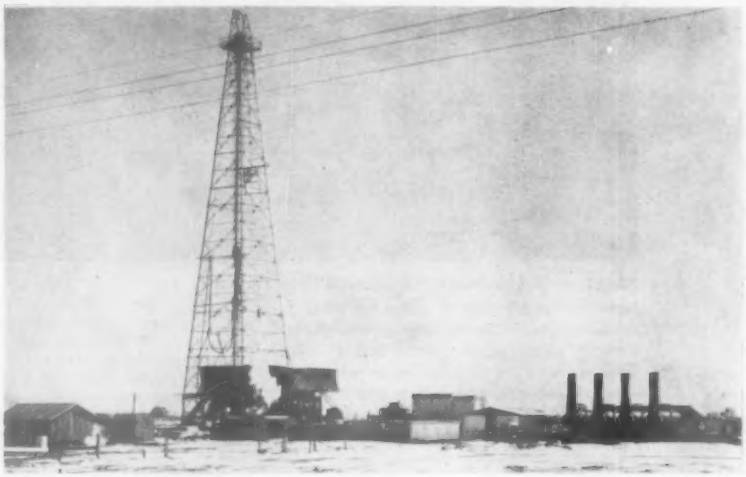

In South Louisiana . . .

Steam drills reentry test

THIS STEAM RIG of Falcon Seaboard Drilling Co. is working on a wildcat in South Louisiana. Venture is Skelly Oil Co. 1-A Raymond Trehan 1 mile northeast of Scott field in 26-9s-3e, Lafayette Parish.

The test was abandoned last October at total depth of 12,960 ft. due to mechanical difficulties encountered in the hole. Steam unit was moved on early this year to drill about 600 ft. of hole to approach old total depth.

Component parts of the equipment include a National 3410 draw works, 1414 Type B Ajax engines, four Lucy 150-hp. 350-psi. w.p. boilers, a 19 by 7¾ by 20-in. National mud pump, a 16½ by 7¾ by 20-in. National mud pump, and a 15¼ by 7¾ by 20-in. Oilwell mud pump.

At last report, the well is testing with a new total depth of 12,961 ft. This rig is one of six steam units Falcon Seaboard has in Louisiana and the firm also has a diesel-electric working in this division.

What one contractor learned about rig time

ANALYSIS of rig time may help gage the efficiency of any drilling operation.

A Texas contractor, LeCuno Oil Corp. of Jefferson, made a study of one of its rigs during an East Texas Smackover test to determine where the time was spent. Rig 4, working for Humble Oil & Refining Co., drilled a hole below 10,000 ft. in Bowie County and a detailed time record was kept from the time the rig was moved on location to the coring and testing point.

The study was broken down into towers and there were four main divisions of periods which included: drilling, trips, repairs, and miscellaneous. During the interim tallied, 10,197 ft. of hole was made.

Of 1,920 hours recorded, 60.3% was spent on drilling, 23.2% on trips, 4.8% on repairs, and 11.7% on miscellaneous. The latter category included: nippling up, waiting on casing, circulating for samples, rigging up, installing new drill lines, running logs, cutting off drill lines, installing drill-pipe rubber, running intermediate casing, checking blowout preventers, running straight-hole tests, mixing mud, jetting mud pits, working on desander, and stormy weather. The first items listed are those requiring the most time.

For the over-all drilling of the well it was interesting to note that the morning and daylight towers drilled the same total footage and the evening tower drilled about 12% more. In each of the main categories, the morning tower spent the most time

on trips and repairs, the daylight on miscellaneous, and the evening the most on drilling. It was not readily apparent whether these factors would hold true on all wells.

The objective of the study was two-fold: to inform company personnel where the time was going, and to devise procedures to give greater efficiency. Suggestions for improvement were solicited from the crews. With the aid of changes in technique which were offered, the firm felt that the study was worth while and will result in better drilling practices and a better-coordinated total team effort.

How one firm cuts costs

A CONTRACTOR, Armstrong-Fowler, Inc., Bakersfield, Calif., figures it can cut costs in moves and rigup by a recent rig modification. In less than a year the revamped equipment will pay for itself and start saving its owner money. No longer will the firm need cranes or A-frames for moves or in rigging up.

Here's what they did. The mud tank and pump assembly were unitized into a 40-ft. legal-sized component. A new subbase was built in which the drill pipe could be racked through it, doing away with additional steel supports for drill pipe at floor level.

The subbase is 7 ft. wide in traveling position and folds out to make an 18 by 18-ft. floor. It moves on a 40-ft. trailer which also holds the kelly and drill collars.

The specially designed drill-pipe trailer was built by Armstrong-Fowler and will hold 1,800 ft. of drill pipe at ground level when it is in operating position. One load in moving contains the mast and draw works which are mounted on a high-bed semi-trailer and another holds the mud and water tanks, doghouse, spare parts, and fuel. Altogether five loads will move the entire rig, a National T-12 with Bender guyless mast which has a 3,000-ft. capacity with 4½-in. drill pipe.

Principle of the design is the use of kingpins on the drill pipe and mud trailers. These rest on the ground when the trailers are on location. On moves, a winch line pulls the kingpin so that it meets the pulling mount of the tractor and the load is ready to roll.

Moving time is not increased by doing away with the need for cranes and A-frames. Moves have been made in less than 3 hours from time of release to spud-in. It takes only ½ hour to unrig and the equipment is simultaneously loaded out and ready to move to the next drill site.

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A0-3-59

WITH DOWELL ENGINEERED ACIDIZING . . .

OPERATOR MAKES WELL BETTER THAN NEW

Engineered acidizing by Dowell is helping operators improve wells in many ways.

Dowell engineers use the "Acid Guide*" to design treatments for better results, lower costs, or both. Also, more and more, Dowell-developed services such as Abrasijet* (abrasive jetting service) and Rockshock* (implosive formation-treating service) are being used to pave the way for more effective acid treatments. In some instances, their use has resulted in successful treatments under conditions that were considered impossible to overcome.

Here are four recent treatments that illustrate how Dowell engineers use acid to help operators get good wells. The first is a case where engineered acidizing actually made a well better than new.

PRODUCTION INCREASED 2½ TIMES AND GAS/OIL RATIO GREATLY IMPROVED

Production from a Pecos County, West Texas well had declined from 250 to 180 bopd. Original gas/oil ratio was 1077 but had increased to 1560. Then an acid treatment, engineered with the aid of the "Acid Guide," increased production to 460 bopd. The treatment also reduced the gas/oil ratio from 1560 to 770.

The original completion was made in June, 1954. Perforations were into the Silurian (Montoyo) pay from 5118 to 5129 feet.

The engineered acid treatment recommended by Dowell used 5000 gallons of acid with a Dowell demulsifying agent added. Injection rate was five bpm at 2200 psi.

Despite the fact that the well is more than five years old, production is now considerably better than it was when the well was new.

WATER SHUT OFF--OIL PRODUCTION RESTORED WITH ABRASIJET AND MUD ACID

In Jones County, North Texas, an old well had gone to 100 per cent water. The well was completed open hole in the Palo Pinto sand between 3100 and 3260 feet. A Dowell water locator showed water entry in the zone below 3230 feet, so this zone was squeezed off with cement.

Then, Abrasijet was used to enlarge the hole and clean the formation at the most productive levels. Next, the well was acidized with 250 gallons of Mud Acid.

After clean-up, production was 56 bopd with **no water.** The operator saved a well that might otherwise have been abandoned.

KENTUCKY OPERATOR GETS 85 BOPD WELL IN AN AREA OF 15 BOPD PRODUCERS

A Dowell acid treatment resulted in a 30-day test of 85 bopd in an area where most wells drop to 15 bopd in the same period.

The well was in Muhlenburg County. Completion was through perforations into the O'Hara formation.

The Dowell treatment consisted of 1500 gallons acid with demulsifying and silicate control agents added. The operator credited these Dowell addition agents with the good results obtained.

DOWELL CUTS THROUGH TWO-FOOT MAGNESIUM BRIDGE PLUG IN SIX MINUTES

Dowell was called to acidize out a 9⅝" magnesium bridge plug that had set prematurely 90 feet below surface. The operator was afraid to drill because he could not get enough weight on the bit to balance the 2000 psi pressure below the plug.

Dowell engineers suggested the use of Abrasijet with acid. A special tool with two downward-pointing jets was run on 3½"-drill pipe and set about one inch above the plug. The pipe was held down with chains.

1000 gallons Dowell acid, carrying one pound sand per gallon, was pumped through the tool at 2500 psi. After six minutes, gas began to blow out the annulus, allowing pressure to equalize above and below the plug. The operator then went in with a bit and knocked the plug to bottom without difficulty.

Here is another example showing how Dowell uses acid **and engineering** to solve difficult problems and reduce costs. The plug was cut through in six minutes as compared to a normal drilling time of at least four hours.

Modern, **engineered** acid treatments as offered by Dowell can help producers increase their profits more than ever before. Call your Dowell representative for prompt service or detailed information. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela and Argentina. Dowell, Tulsa 1, Oklahoma. *Dowell Trademark

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TO HELP YOU MAKE MORE PROFIT

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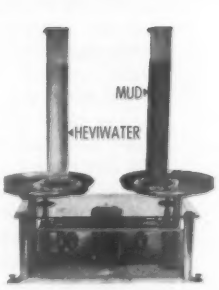
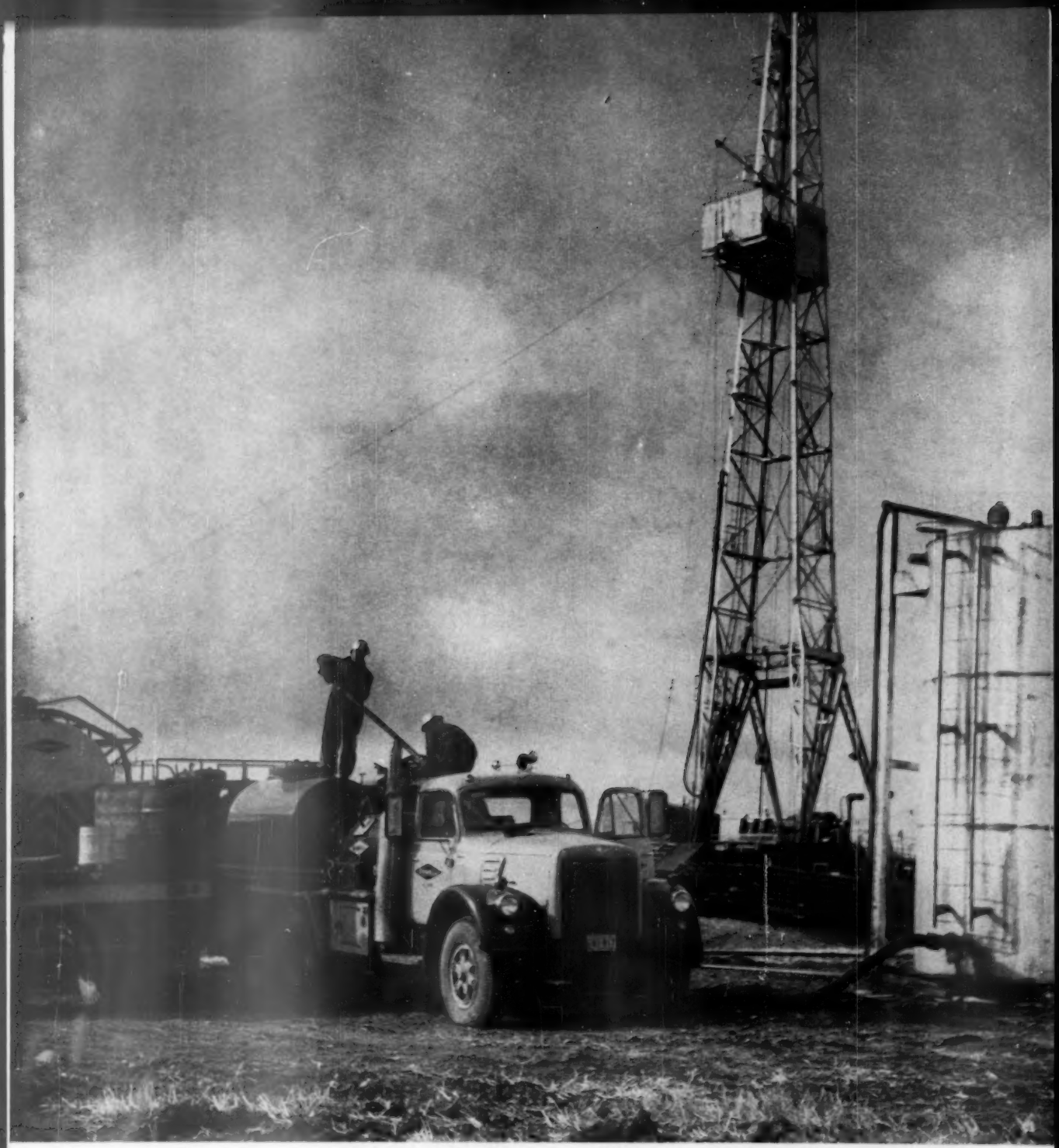
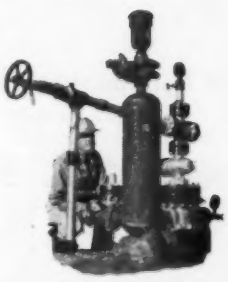




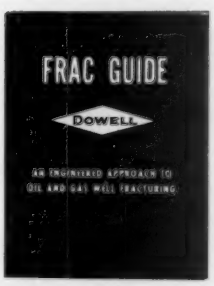
PARAFFIN INHIBITOR

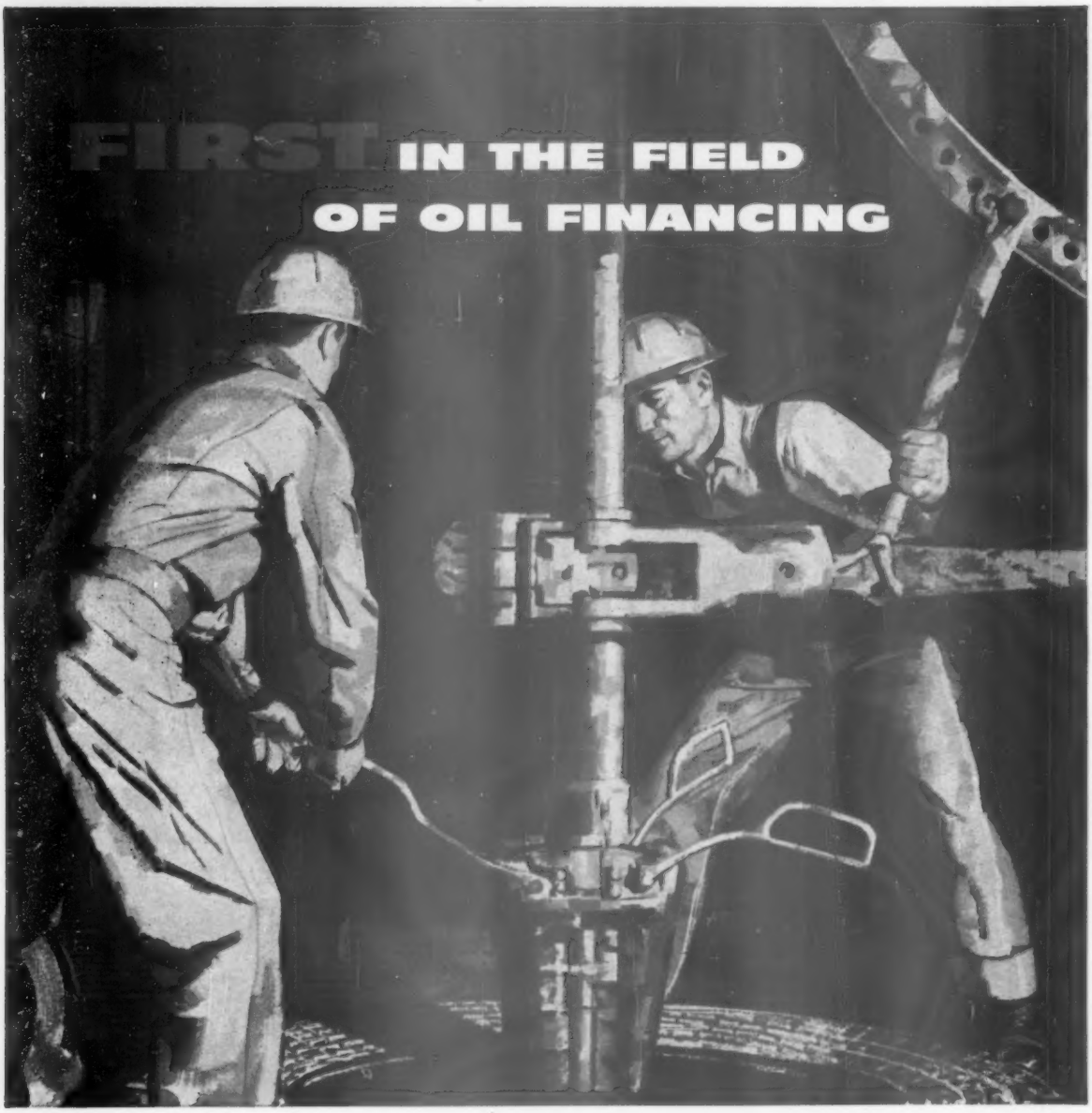
This new Dowell material operates on an entirely different principle. The chemicals used do not dissolve paraffin, but are actually designed to prevent its deposition. Small amounts of the inhibitor are injected into the well periodically in the same manner as corrosion inhibitors. Careful preparation of the well is required before the treatment begins.



"FRAC GUIDE"

This Dowell collection of charts and formulas is arranged to aid in the more effective engineering of fracturing treatments. With the "Frac Guide," Dowell engineers can help you select the proper type and volume of fracturing fluids, sand sizes and quantities, injection rates and treating procedures — to give optimum results at the lowest possible cost.





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THE OIL IN SPAIN lies mainly in the plain. That's the belief of these top-level Spanish geologists and engineers, now on an extensive tour of the U. S. In the usual order they are: Carlos Munoz C., chief engineer, Geological & Mining Institute; Francisco Martinez, interpreter; Jose Castells C., chief engineer, Petroleum Services; Joaquin Borrego G., instructor, Geological & Mining Institute; W. J. Doremus, International Cooperation Administration and project manager; Jose M. Rios, professor of geology, School of Mines; Santiago Garcia F., chief, mining department, National Institute of Industry; Augusto Galvez C., instructor, G&MI; Rudolf M. Schreiber, geologist, Petrolifera Iberica, S.A.; and Javier Larraz, interpreter.

Spanish study team swabs U.S. oil men

BY FRANK J. GARDNER

THESE SMILING Spaniards are incurable optimists. And why not? They're geologists and geophysicists, most of them. The two engineers in the group lean a bit to the conservative side, but optimism is the keynote over-all. And they're all hoping for the same thing . . . oil in Spain.

These are top-drawer specialists from Madrid. One is a field geologist for a private German-Spanish exploration company. Collectively, they're known as the Oil Exploration and Production Study Team. During a 5-week visit to the United States, they hope to learn what makes the oil business tick. More specifically, they want to know how exploration is organized and managed, what technology is involved, and how government regulation works.

On a 1-day tour of some Oklahoma fields, the Spanish team took a good hard look at several water-flood operations. Cameras clicked, notebooks fluttered, and questions flooded the engineer in charge at every stop.

But between stops, these specialists parried questions on their own. And their answers paint a picture of an oil-hungry nation on the verge of discovery.

What parts of your country offer the best chance for oil? "Perhaps the north is best, in the region south of the Pyrenees. Here there is a large sedimentary basin with most favorable indications of structure and stratigraphy. Other possibilities definitely exist in the southern region around Seville and to the east of it. Also, there are fair chances in the eastern coastal plain."

What about the Spanish Sahara? "There, too, we are most hopeful. As you know, 21 different companies have taken concessions there. We don't know too much, actually, about what underlies the Sahara. But the seismic tools will tell us. There's 370,000 sq. km. to be explored, and if events to the east in Algeria and Libya are any indication, we have a good chance, too."

What exploration is going on at present? "In Spain, seven rigs are at work today. Do you realize that only 60 wells have been drilled there since 1939, when serious exploration first began? Today, one well, the 1 Alda, 20 miles east of Vitoria (in the northeastern plain), has reached a new depth record of 16,474 ft. Also, several seismic crews are now in the field."

Have you had any indications that oil is there? "Yes, indeed. There have been good showings of gas in some of the wells, and a few small shows of oil. You may know, also, that in South Central Spain, south of Madrid, an oil-shale deposit has been worked for many years, producing lubricants."

Are your universities turning out any oil finders? "At present, we offer degrees only in mining engineering; perhaps 30 to 40 graduates per year in this field. But there is increasing interest in petroleum geology, and we are offering more of it all the time. Perhaps soon we will turn out petroleum engineers and geologists as specialists in those fields."

If oil were found, certainly it would have an immediate market. Any comments on this? "We have two large refineries, one in the Canary Islands, and one on the southern Mediterranean coast. There are several smaller ones scattered about. Yes, any oil we find today could go to market tomorrow!"

In the face of such optimism and such increasing interest in her oil potential, it's hard to believe that Spain will long remain a "have-not" nation in oil.

Wheland Planetary HP-16000 Pump owned by O. E. Hall Drilling Company on location near Seminole, Texas. Left to right: O. E. Hall, Jr., Supt.; Fred Landis and Bill Carlisle, Tool Pushers.

"... the pump has improved our operation ...we will be happy to recommend it."

O. E. HALL, Jr.

WHELAND PLANETARY HP-16000 PUMP

Duplex Power Slush Pump

7¾"x16", 600 HP at 65 RPM

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February 16, 1960

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Mr. Gordon L. Smith, Jr.
Manager Rotary Drilling Equipment Sales

Dear Mr. Smith:

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All of these wells have been located in West Texas. We operate our rigs throughout the Permian Basin covering a depth range of 4, 500 feet to 12, 500 feet with modern equipment.

We want to commend The Wheland Company for stepping forward with this improved design in slush pumps, and we will be happy to recommend it.

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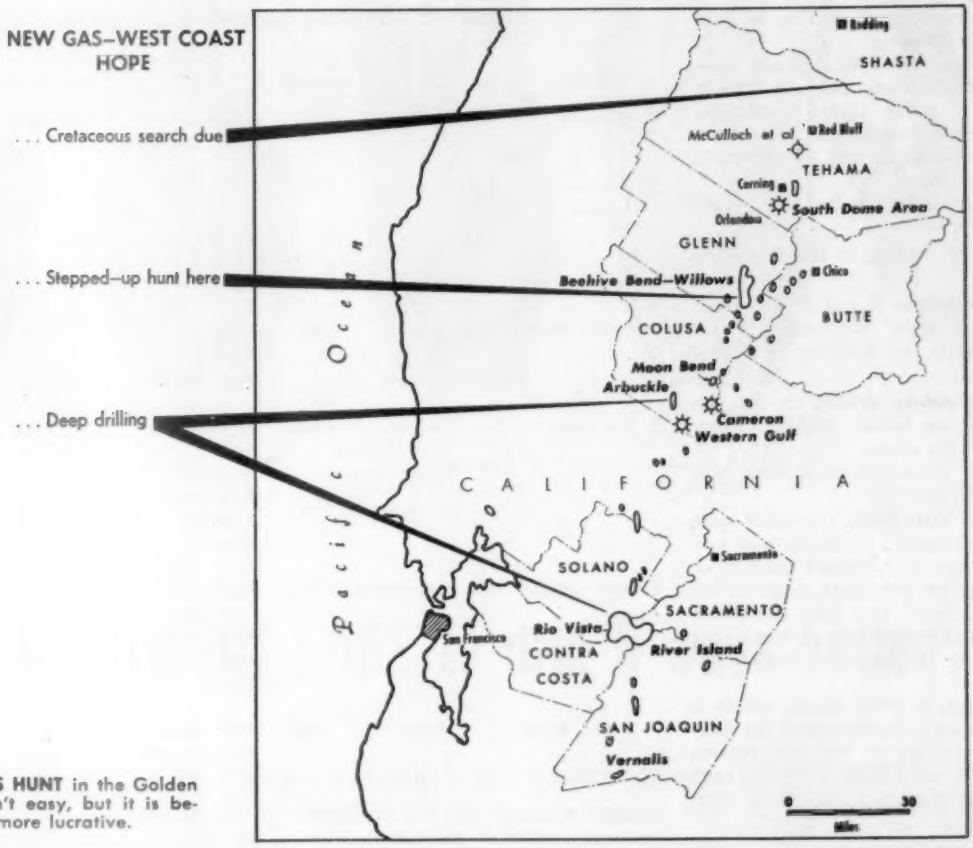


THE GAS HUNT in the Golden State isn't easy, but it is becoming more lucrative.

Biggest gas year yet is California outlook

BY WILLIAM T. SMITH

THE STEADILY increasing emphasis on gas wildcatting in California is expected to take its biggest jump yet in 1960.

A combination of factors, paced by a depressed crude market and a rapidly expanding gas market, are behind the trend.

On the plus side are these points:

. . . **Drilling is easy** and comparatively inexpensive. For around $80,000, a California operator can drill and complete a 6,500-ft. gas well. Slim-hole drilling techniques are easily adapted to the formations encountered making substantial economies possible.

. . . **Farmout deals** from majors are readily available on attractive terms.

. . . **The market** is there as the state's population paces the nation in growth. Payouts of up to a year are not uncommon with an occasional 6-month payout turning up.

However, it isn't quite as easy as it sounds. There are a couple of hazards, namely:

Contracts are tough to negotiate. Operators in the gas counties have only Pacific Gas & Electric Co. to sell their gas to. Gas producers are almost unanimous in agreement that PG&E drives a hard bargain. For instance, at last count there were more than 90 wells shut in in the gas counties which were on "beneficial-use" contracts with PG&E.

In essence, a beneficial-use contract means the purchaser has the option of taking gas only when it is beneficial to his use. This leaves the producer at the complete mercy of the purchaser. In addition, a significant number of new gas wells were being signed up on a 25% deliverability basis. This also cuts way into the potential revenue of the producer.

Most contracts negotiated these days call for a selling price of from 24 cents to 30 cents a thousand.

One thing which could prove helpful, pricewise, for the gas producer was a recent development in southern California. There, a major gas utility was offering to supply gas to an electric generating utility for 47 cents per M.c.f. This could mean that California producers might expect to get as much as 33 or 34 cents per M.c.f. for this particular gas.

In any event, competition among the northern California PG&E and the southern California Pacific Lighting Gas Co. subsidiaries for gas supplies was increasing with the prospect that producers would benefit by increased prices.

Geology is the other main hazard. Most of the big gas plays are in areas of heavy faulting. Typical of this is the Beehive Bend - Willows area in Glenn County. There virtually every well is considered a wildcat due to the faulting and highly lenticular nature of the sands. This condition is reflected in the high ratio of 21 dry holes to 59 producers last year in

strictly development drilling in California gas fields.

Although the northern and central California gas counties consist largely of gently folded northwest-southeast-trending anticlines, the bulk of the wildcatting will be in stratigraphic traps.

In general, here is how the search shapes up:

... **Deep drilling** in the Rio Vista basin.

... **Cretaceous** E and F zone drilling in the upper Sacramento Valley as far north as Redding in Shasta County.

... **Stepped-up drilling** in the Arbuckle, River Island, Walnut Grove, and Vernalis areas.

Taking them one at a time, this is the picture:

... **Rio Vista basin.** Operators were watching closely a 15,000-ft.-plus well being drilled by Standard Oil Co. of California on the north edge of big Rio Vista field. This field, the state's largest, spills over into parts of four counties in the southern Sacramento Valley.

The test, 1 Peter Cook, seems a cinch to set a depth record for Cretaceous drilling in the gas regions and could set off a flurry of such drilling if it turns up anything commercial.

... **Upper Sacramento.** Oil companies, both large and small, have been very active in leasing parcels in such northern counties as Shasta, Glenn, Tehama, and Butte as the result of a couple of late developments.

One was a dry hole drilled by McCulloch Oil & Exploration Co. of California 9 miles south of Red Bluff in Tehama County. Although eventually abandoned, it had significant oil and gas shows from Cretaceous formations. If it had been successful, it would have ranked as the northernmost producer in the Sacramento Valley. It is sure to be followed by a number of wildcats as soon as the weather permits, probably in late April or May.

While the McCulloch well missed being the northernmost well, one drilled about 12 miles south of it, and which was completed as a new-pool discovery last year, will in all probability also be followed up by a number of wildcats. This was Buttes Gas & Oil Co. A-5 Saldubehere which was completed in the Upper Cretaceous Kione sand in the South Dome area of Tehama County. It found initial production of 7,219 M.c.f. daily through a ⅝-in. choke in a formation between 2,340-70 ft. Buttes had almost 26,000 acres under lease in the vicinity.

The area from Orland, north through Corning and on up north past any production as far as Redding in Shasta County, experienced a leasing boom the first quarter of this year.

IMPORTANT NORTHERN CALIFORNIA GAS FIELDS

Field	County	Year opened	Pay	Prod. depth	No. of wells
1. Arbuckle	Colusa	1957	Chico-Forbes Chico-Guinda	4,429-6,250	21
2. Willows-Beehive Bend	Glenn	1938	Wild Goose Forbes (17 pays) Guinda	1,860 5,192 5,921-6,703	73
3. Corning	Tehama	1944	Tehama	1,200	14
4. Maine Prairie	Solano	1945	Meganos Panoche Martinez	4,654 6,172 6,502	15
5. Rio Vista	Solano Contra Costa Sacramento	1936	Nortonville Emigh Hamilton Anderson Midland Martinez	3,700 4,115 5,330 5,700 4,400 6,600	155
6. River Island	Sacramento	1950	Nortonville Domengine River Island Meg.-Martinez Copay	3,650 3,720 4,130 4,380 4,290	26
7. Sutter Buttes	Sutter	1933	Wild Goose Forbes-Guinda	2,065 5,365	12

... **Arbuckle.** Both Occidental Petroleum Corp. and Western Gulf Oil Co. will push drilling programs in this booming Colusa County gas field north of Sacramento. Occidental has a farmout deal from Western Gulf in which they divvied up 34,000 acres in 160-acre checkerboarding parcels. Thus far, Occidental has completed seven consecutive producers on its acreage, including one significant stepout located more than a mile from the nearest field producer.

In addition, Western Gulf made a new pool discovery 6 miles southeast of the field recently and Cameron Oil Co. made a find in the same general area 10 miles northeast of Arbuckle and 6 miles southeast of Moon Bend field.

One interesting project which will be closely watched will be a 12,000-ft. test slated by Occidental in the main Arbuckle producing area. This will easily set a depth record for Cretaceous drilling in the region. All of these developments point strongly to a drilling boom in this region this summer and fall.

... **River Island.** Brazos Oil & Gas Co. was getting ready to resume its thus far highly successful drilling program in this San Joaquin County play. Last year, Brazos discovered three new pools at River Island, and in the process gave California its first triple-zone gas completion in one.

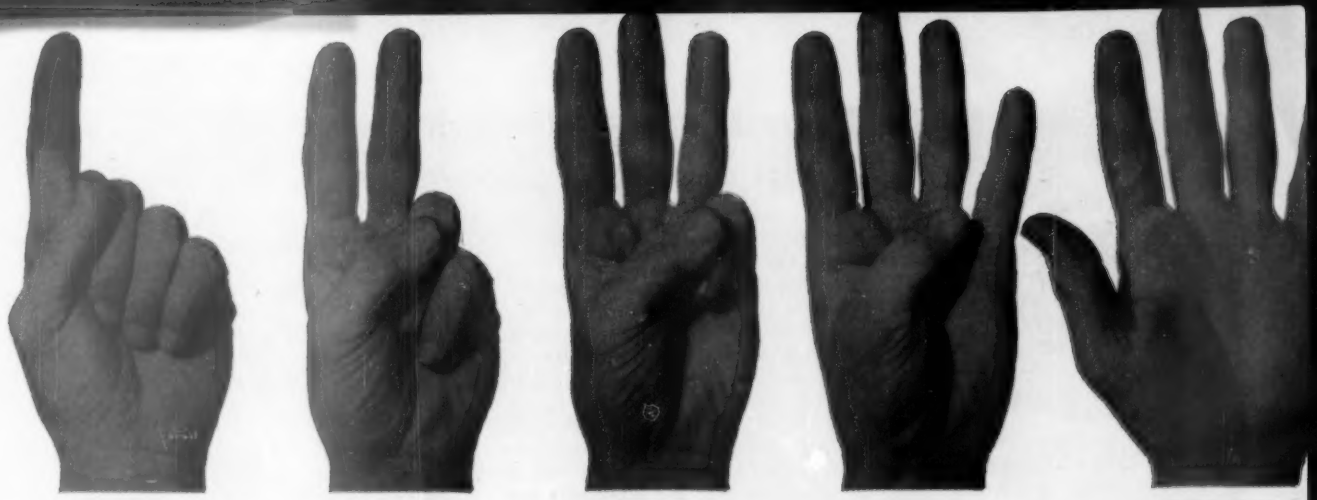
Brazos was preparing a location for an extension test about 2,000 ft. southeast of a new pool discovery it made last October on the northeast edge of the field. This well, 2 M&T Brazos-Sunray, found production in the lower Eocene Midland zone at 4,096-4,105 ft.

In addition to Brazos' three finds at River Island last year, E. C. Brown, operator, also turned up two new pools there.

... **Walnut Grove.** This area, 2½ to 3 miles northeast of the River Island activity, is also slated to see a modest drilling boom as a result of at least three new pool finds turned up by operators there last year. Brazos was credited with a pair of the finds, one an Eocene and the other a Cretaceous pool. Texaco Inc. found a shallow Nortonville-Eocene pool there.

Also in the same general vicinity of the same County, Standard Oil Co. of California found a deeper Cretaceous Winters sand pool at West Thornton which could also precipitate some additional drilling.

... **Vernalis.** Last year, Great Basins Petroleum Co. and Porter Sesnon et al., maintained their record of successful development and wildcat drill-



BETTER drilling rates in all types of muds: T-8, lime, gyp, and low pH, with varying amounts of oil.

BETTER (lower) barite requirements when substituted for oil in muds.

BETTER hole lubrication, in all types of muds, to reduce pipe sticking.

BETTER bit bearing life **even in high solids muds.**

BETTER geological interpretation and electrical logs; no fluorescence.

PLAN WITH BIT LUBE to drill 5 ways better . . .

MAGCOBAR PLANNED MUD PROGRAMS make the above statements facts, not claims. In high weight emulsion muds, for example, the Magcobar engineer properly substitutes Bit Lube® for some of the oil to cut drilling costs by reducing the amount of barite required. In a typical well, the oil content of the mud was allowed to drop from 11 to 5 per cent. Bit Lube was added to this 17.8 lb./gal. lime mud with these savings in barite:

	Sacks of barite per day	Cost of barite per day	Cost of Bit Lube per day	Cost of Oil per day	Total Cost per day
Emulsion (2 week average)	177	$409.76	$—0—	$74.03	$483.79
Bit Lube and Emulsion (3 week average)	52	120.38	122.43	8.25	251.06

NET DAILY SAVINGS WITH BIT LUBE: $232.73

Not only does Bit Lube give direct cost savings, but it also offers escape from costly pipe sticking, even in extreme directional holes. Bit Lube lowers the friction coefficient of the mud, to give over-all higher drilling mud performance. These savings can be added to those in the chart.

The skilled use of good products like Bit Lube to cut drilling costs is the heart of Magcobar Technology. Let the Magcobar engineer plan the mud program for your next well and this Technology will save for you all along the line.

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ing in this San Joaquin County area by turning up at least two new pools and a marginal new field discovery.

This year, Great Basins plans one well at West Vernalis, three development wells in the field, and a 10,000-12,000 ft. deep test in the main area. In addition to those programed wells at Vernalis, Great Basins has a five-well program tentatively slated for the Manteca-Modesto area northeast of Vernalis. The first was scheduled for a site 5 miles northeast of the nearest Vernalis producer.

In addition to these tests, Trico Oil & Gas Co. had a wildcat planned for a site 8 miles south of Vernalis on a farmout from Great Basins, and McCulloch Oil Exploration Co. of California had a test planned for Union Island 10 miles north of Vernalis.

Three Illinois, Indiana drill sites report important discoveries

THREE AREAS in the Illinois basin reported significant discoveries last week, Christian and Richland counties, Illinois, and Spencer County, Indiana.

In Christian County, 3 miles southeast of Mount Auburn, Warren Baughman and Roy Osborn 1-A Matthews in NE SW SW 22-15n-1w flowed 550 bbl. of oil daily through partially opened valve after fracturing the Silurian at 1,919-25 ft. This well is a ¼-mile stepout and is the best producer yet in this new area.

Richland County. Good Rosiclare lime production is reported at Zanetis Oil Properties 1 J. G. Scherer in SW SW SE 7-3n-11e, 2 miles southeast of Olney. The well pumped and flowed 278 bbl. per day from 3,210-18 ft.

Spencer County. In southwestern Indiana, 3 miles south of Lincoln City, Fred Heldt 1 Clarence Ferguson in SW SW NW 17-5s-5w made 144 bbl. of oil per day on pump from McClosky at 1,136-48 ft.

In the area 2 miles northwest of Grandview, Art Althaus completed the best well yet in the area at 2 William Lehr in NE SE NW 36-6s-6w. It pumped 150 bbl. daily from Benoist at 1,201-15 ft.

Here are totals for 1959 drilling action

The accompanying tables give a rundown of service and condensate well depth classifications for 1959. These tables are part of the over-all classification of wells found on pp. 258 and 263.

Service Wells

	A	B	C	D	E	F	G	H
Colorado				3	1			
Illinois	44	179	54					
Indiana	3	1	4					
Kansas	2	9	44	22	2			
Kentucky	32	4	1					
Louisiana, South		5	5			2		1
New York		80						
Ohio	1	11	66					
Oklahoma	16	57	32	2	2	2	1	
Pennsylvania		94						
Texas	90	147	115	43	7	1		
District 1		1						
District 2					1			
District 3		1		1				
District 4	4	7	2	2				
East	1	1	1	1				
District 7-B	17	19	7	2				
West	6	27	65	14	3			
District 9	62	86	36	23	3			
District 10		5	4			1		
West Virginia		25	1	2	11			
Wyoming	17	8	6	3	7			
California	3		13	31	14			
Michigan			44	9				
Arkansas		4	1					
New Mexico	4		4	5				
Total United States	212	624	390	120	44	5	1	1

Wildcat Condensate

	A	B	C	D	E	F	G	H	I
Louisiana						1	5	6	4
South						1	5	4	4
Offshore								2	
Oklahoma				1	5	12	2		
Kansas					1				
Texas			1	6	17	18	18	1	3
District 1									
District 2					2	4	3		
District 3						8	12	1	2
District 4			1	1	7		2		1
East						2			
District 7-B				4	1				
West				1	5				
District 9									
District 10					2	4	1		
Mississippi						1	1	1	1
New Mexico					4	3			
Wyoming					1				
Total United States			1	7	28	35	26	8	8

Field Condensate

	A	B	C	D	E	F	G	H	I
Kansas				1	7				
Colorado				1	1				
Louisiana					8	45	115	131	46
South					6	34	91	107	41
Offshore					2	8	24	24	5
North						3			
Mississippi				3	1	10	7	4	1
New Mexico				1	37	6		1	
North Dakota							5		
Oklahoma		1		5	48	23	7	1	1
Texas		2	9	35	173	267	113	20	4
District 1		1			1	6	6		
District 2				1	29	71	5		
District 3				20	60	40	12		
District 4				10	3	120			
East				4	40	30	10	1	
District 7-B			9		3				
West		1			3		46		4
District 9								16	
District 10					34		34	3	
Wyoming						1			1
Total United States		3	9	46	275	352	247	157	53

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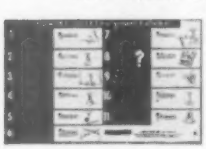
For example, the **Fig. 1040-A Valve** shown here, made from carbon steel, is rated for 10,000 psi at 150°F. Each of these valves is individually tested at 15,000 psi before it leaves the factory.

R-P&C's complete line of bar stock valves includes constructions in 12-14 chromium stainless steel, 18-8 molybdenum stainless steel and bronze. Sizes range from ⅛" to 1" in globe and angle styles with female ends, male and female ends, or male union ends. For extremely severe throttling services, R-P&C bar stocks can be supplied with stellite discs for extra abrasion resistance.

Your R-P&C distributor carries not only a complete line of bar stock valves but also a wide selection of gate, globe, angle and check valves in bronze, iron, and cast and forged steel. You will find the answer to your valve problem in his selection.



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usi Axelson PUMPING NEWS

Rising Costs Increase Use of On-or-Off Attachment

Saves Stripping Jobs. For over 20 years operators have been using the Axelson On-or-Off attachment as a safety joint to protect the rod string investment in sandy wells. It is impossible to estimate how many stripping jobs this attachment has prevented, or how many tens of thousands of dollars it has saved producers over that period of time.

After Sand-Fracing. In many sections of the oil country, it has become standard practice to install the On-or-Off attachment whenever a pump is run after a sand-frac job, because of the severe sanding up which may occur.

Reports from the field give many other uses of the On-or-Off attachment. For example:

Two-Zone Pumping. In West Texas the attachment is being used on practically every two-zone pump installation. Its use allows the pump to be run on the tubing, as a safety factor. It also insures proper spacing and seating of the pump.

Running Insert Pump. The On-or-Off tool is frequently employed when running a long insert pump through tubing to guard against the possibility of a stripping job if the pump becomes stuck in a tight spot.

High Water Cut Wells. Another cost-cutting application of the On-or-Off attachment is in wells where increasing water encroachment compels greater fluid lift for economical production. With the attachment, larger bore pumps can be used without going to larger size tubing or having to run the rods and tubing together. For instance, a 2½" TL pump can be used on 2" tubing, or a 4" pump on 2½" tubing. In the same type of application, the On-or-Off attachment can be used with a casing pump.

Easier Paraffin Removal. Wells with moderate paraffin conditions often handle the problem by installing paraffin knives or a series of scrapers above the On-or-Off attachment. This allows the rod string to be released, paraffin removed and the string re-set, all without unseating the pump.

Ask your Axelson representative to show you how the exclusive positive load action of the On-or-Off attachment keeps the threads shouldered at all times for positive seal. The attachment also has a self-centering action. Only ¼ turn rotation is needed to release, and both engagement and disengagement are positive. When engaged, the unit is as solid as a one-piece coupling, and foreign matter cannot enter.

How to Select the Proper Polished Rod

The one right polished rod for any pumping job is the one which best combines required strength and wearing qualities at lowest cost. Since no single material can do this under all conditions, Axelson supplies a complete line of polished rods of different metals and characteristics.

For light service #55 rods of cold-drawn carbon steel are usually recommended.

Medium service indicates #60 rods of medium carbon steel.

For normal to heavy service, alloy steel specially treated is used in #59 rods.

For special conditions involving severe corrosion and/or abrasion, Axelson polished rods are available in bronze, stainless steel, Axtrahard hard-faced, and chromium-plated.

"Triple-H" Polished Rods. These are an example of the new materials which Axelson research is developing. "Triple-H" polished rods are currently available in two lengths for the 26-foot and 31-foot Hydrax Pumping Units. This rod is made from a special stainless steel alloy, precipitation-hardened to a Rockwell C reading of about 40. It is extremely resistant to both abrasion and corrosion, and has a tensile strength of approximately 110,000 psi minimum yield.

"Triple-H" rods have seen wide use, particularly in West Texas wells where corrosion is severe and abrasion has always been a problem. "Triple-H" rods have been carefully inspected after two years continuous service under these difficult conditions, and no measurable wear, corrosion or metal fatigue has been found. The conclusion is definite that "Triple-H" polished rods outwear and outperform all others under severe conditions.

"Triple-H" rods are held to finish tolerances of less than .003"—a necessity with the high-pressure seals of hydraulic pumping units.

The maximum straightness and finer finish of all Axelson polished rods pays off at the well head in lowest possible friction losses for longer rod and packing life and reduced downtime.

Packing also is important for best service, and should be carefully chosen. Marlo packing cuts costs and friction both, because its special semi-metallic inserts form a smooth, resilient bearing-like surface which stands up in heavy service and will not harden or burn during pumpoff.

Your Axelson representative is qualified to recommend the combination of polished rod and Marlo packing which will give you greatest service with long term economy.

Tests show that the surface of an Axelson polished rod is measurably smoother than that of ordinary milled-finish rods. Axelson creates this finish by centerless grinding—a more expensive method, but the only one which will finish to Axelson specifications. In addition, close tolerances are held throughout manufacture to insure maximum straightness.

Oklahoma activity centers from Red River to north

The Davis area wildcat, drilled by Continental Oil Co., and Sinclair Oil & Gas Co., was completed with production in the Second Bromide sands of Ordovician age to give Murray County in the southern part of Oklahoma an important new oil find.

The joint venture, 1 Springer in SW SW NE 31-1n-2e, flowed 127 bbl. of oil in 18½ hours on 12/64-in. choke from perforations in the Second Bromide sand at 6,921-31 ft. A test flow got 165 bbl. per day. Earlier, the well had commercial production indicated in the Third Bromide sand.

Dewey County. Far to the northwest, in Lenora field, Amerada Petroleum Corp. 1 Bartonbach in NE SW 15-18n-18w, flowed 11,900 M.c.f.d. from Morrow Pennsylvanian perforations between 10,320 to 10,418 ft. on 24/64-in. choke. Indicated open flow rate was 26,600 M.c.f.d.

In Garfield County, North Central Oklahoma, G-K Industries 1 Hayton in SE NE NE 23-24n-3w, northwest of Billings, flowed 40 bbl. of oil hourly on 28/64-in. choke from Second Wilcox sand at 4,806 ft.

Okfuskee County. In eastern Oklahoma, Olin Oil and Gas Co. 2 Slepka in the Cowan district, SE SE SE 7-11n-10e, flowed oil at the prolific daily rate of 1,250 bbl. from Cromwell sand at 3,272-82 ft.

In Garvin County, southern Oklahoma, New Hope Southeast field added a third producing zone, the McLish Ordovician sand. Cities Service Oil Co. 1 Brown-K, C SW NE 16-4n-3w, flowed 14 bbl. condensate in 1 hour and 8 M.M.c.f.d. during tests from perforations at 9,663-9,743 ft. Previous tests had gas-condensate and oil in First and Second Bromide sands.

Woodward County. New West Chester field has three producers. Ashland Oil & Refining Co. 1-A Wyckoff in C SE NW 3-20n-17w flowed 23,600 M.c.f.d., absolute open flow, from Chester Mississippian at 8,016-32 ft.

Ellis County field confirmed in Oklahoma

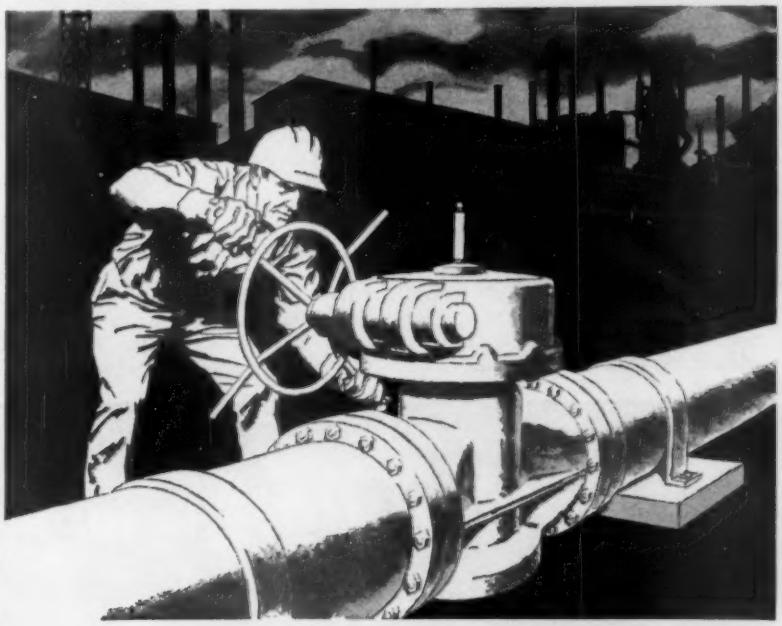
Official confirmation of a Morrow Pennsylvanian gas field in northwestern Oklahoma's Ellis County was announced with completion of Mobil Oil Co. 1 Anna Ruff Unit in South Goodwin field, C SE NW 35-20n-26w.

The Morrow gasser flowed open at the calculated daily rate of 13,500 M.c.f. from perforations at 10,996-11,175 ft. Location is 9 miles northwest of Arnett and 1 mile west of the field discovery and lone producer. The field was opened 4 years ago at Magnolia 1 Meier in C SE NW 36-20n-26w. That Morrow discovery flowed 12,800 M.c.f.d. from 10,822-11,167 ft.

Major County gets new Manning oil production

An important oil and gas discovery for western Oklahoma's Manning trend is Oklahoma Natural Gas Co.'s 1 I. H. Greer, 3½ miles west of Ringwood in northeastern Major County.

The Manning Mississippian discovery was completed for a calculated open flow of 877 M.c.f.d. and 20 bbl. of 40.8°-gravity oil daily. Location is in C NE SW 18-22n-10w, ¾ mile northwest of Livingston Oil Co. 1 Koehn, lone producer in East Forest Home field. That Manning well flowed 250 M.c.f.d. and 120 bbl. of oil in 6 hours. The new discovery is also 1 mile east of Northwest Ringwood Manning field, a gas-condensate producer. Recent Manning developments to the southeast in Kingfisher County make this one of the most interesting and attractive new oil and gas plays in Soonerland.



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Tripay discovery reported in southern Oklahoma

Southern Oklahoma's Stephens County has triple oil and gas-condensate production news at Shell Oil Co. 1 Cash Unit in C SE SW 23-1n-8w.

The three-zone discovery, located at Southeast Stage Stand, found oil production in the Missouri, and gas-condensate in both Missouri and Des Moines, all Pennsylvanian in age. Flow was 173 bbl. of 35.9-gravity oil per day on 24/64-in. choke from perforations at 6,841-68 ft. in the Missouri. Open flow of 4,500 M.c.f.d. and 20 bbl. condensate per million was reported in the Missouri at 7,133-76 ft. The Des Moines at 7,256-76 ft. made 4 M.M.c.f.d., open flow, and 10 bbl. condensate per million.

Important B. C. find

The important discovery well of North Kotcho Lake in northeastern British Columbia was completed by Pacific Petroleum, Ltd., at B-44-C North Kotcho Lake, drilled on quarter unit B, Unit 44, Block C, NTSIM 94-P-3, 55 miles northeast of Fort Nelson.

The well flowed 105 M.M.c.f.d. on open-flow tests from Slave Point Middle Devonian reef section.

Your Geologic Correlator Is Here!

Special feature of this week's issue is the Journal's new 2 by 2-ft. geologic correlator and map of the nation's major basins. It illustrates occurence of formations across the nation and shows where they're productive.

Additional copies of this issue's correlator insert can be obtained at 50 cents per copy by writing Reader Service, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

Los Angeles town-lot wells still busy

DRILLING of both the wildcat and development type was continuing at a brisk clip in metropolitan Los Angeles. Included in the activity were these current tests:

... **Brentwood.** Mobil Oil Co. was drilling below 6,140 ft. on its wildcat on the Brentwood Country Club in West Los Angeles. This test is one of the most northwesterly tests ever drilled in metropolitan Los Angeles. It is on a 149-acre drilling district site which includes a few town-lot parcels as well as the golf course. A 10,000-ft. total depth is programed. The nearest production is about 3 miles to the south on the Twentieth Century film lot.

... **Beverly Hills.** Allan Guiberson, operator, was completing his second well on the Beverly Hills High School grounds immediately east of Twentieth Century's production.

... **Cheviot Hills.** Signal Oil & Gas Co., as operator for itsself and Richfield Oil Corp., was drilling the eighth well on the Hillcrest Country Club lease and the fifth on the neighboring Rancho golf course lease.

... **Culver City.** Continental Oil Co.'s second try, following a successful discovery with its first wildcat, on the M-G-M movie lot in Culver City was drilling below 8,840 ft. on its second redrill. The second test, 1 Culver City was first taken to 9,594

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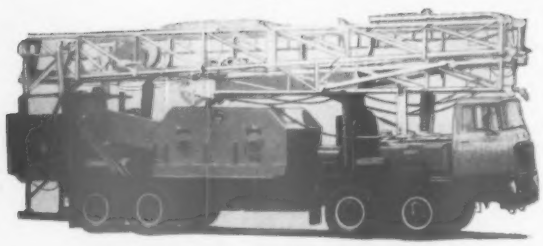

Typical Cooper servicing and workover unit with Skytop Derrick. DIAMOND Roller Chains deliver power for servicing to 14,000 ft.—for workover to 12,000 ft.

ft., plugged back and redrilled to 9,195 ft. and plugged back again and was redrilling as noted below 8,840 ft.

... **East Los Angeles.** General Exploration Co. was redrilling below 8,999 ft. on a wildcat in east Los Angeles about 1 mile southeast of the nearest producer in the East Los Angeles field. This test, 1 Conoco A, was originally taken to 9,594 ft. before being plugged back for the current redrill.

About ¼ mile northwest of the Bandini field producing area, Nordon Corp. was drilling below 7,620 ft. on a test which reportedly had oil and gas shows in a shallow interval.

... **Salt Lake.** Union Oil Co. of California was drilling below 1,200 ft. on its second wildcat in the area of the old Salt Lake field in west Los Angeles. The first wildcat failed to turn up commercial production after being drilled to 9,512 ft., and then redrilled twice to 7,713 ft. and 6,186 ft.

... **Inglewood.** On the southeast edge of the Inglewood field in southwest Los Angeles, Humble Oil & Refining Co. was running logs in an extension test which was originally drilled to 13,516 ft. and then redrilled to 11,022 ft.

Arbuckle extension shows potential in California

A 10,200-ft. wildcat being drilled by Western Gulf Oil Co. 4,000 ft. southeast of a discovery made earlier this year in Colusa County's Arbuckle area showed big promise on a test of a zone at 8,094-8,119 ft. The well, 1 Wilkins Unit B, flowed at a rate of 7,400 M.c.f.d. through a ½-in. choke on a 2½-hour test.

This extension is about 4,000 ft. southeast of a well Western Gulf completed January 1 as a new gas-field discovery 6 miles southeast of the big Arbuckle field. The discovery well, 1 F. J. Strain, was perforated between 8,468-87 ft. for a flow rate of 2,910 M.c.f.d. through a ⅜-in. choke.

California's Northwest Belgian anticline active

Activity in the PML 28-14 pool area on the west flank of the northern limits of Kern County's Belgian anticline was picking up with two recent completions pointing up the large productive potential of the play.

Shell Oil Co., discoverer of the pool, brought in an extension test about 600 ft. north of the first well flowing 682 bbl. daily of 33°-gravity crude through a 24/64-in. choke. The productive interval in the well, 26-14 PML, was 6,090-6,145 ft. The discovery well was perforated between 5,760-80 ft. in an Oceanic-Oligocene sand.

About 1,500 ft. west of the discovery well, Ohio Oil Co. joined the producer list with a well completed at 6,057-86 ft. and 6,098-6,118 ft., flowing 1,050 bbl. daily of 34.5°-gravity crude through a 21/64-in. choke.

New producers for Kansas' Wilhelm

WILHELM FIELD in Kansas' Kan-Neb basin has several new producers. Skelly Oil Co. added wells at the northeast and southwest ends of the Rawlins County Pennsylvanian producer.

The 1 Wicke in SW SW 16-1s-32w was completed pumping 235 bbl. of 32.7°-gravity oil per day from two sets of perforations in the Lansing-Kansas City between 3,995 and 4,052 ft. The 1-A Meyer in C NE SW 20-1s-32w, on the southwest side of the field, pumped 226 bbl. of oil daily from Lansing-Kansas City at 4,133-42 ft.

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Other recent completions include 2 Wicke in C NE NE 20-1s-32w. That well pumped 199 bbl. daily from the same pay. The 3 Wicke in C NW SE 20-1s-32w on the southwest side of the field swabbed 74½ bbl. of oil in 5 hours from perforations at 3,965-70 ft. Pump is being set up here.

There is considerable undrilled area around Wilhelm field. There has been no drilling at all between the field and Kompus field 2 miles south. That Skelly 1959 discovery, SW SW SW 33-1s-32, pumped 30 bbl. of oil per day from Lansing-Kansas City.

Pennsylvania drilling shows spring upturn

In northeastern Jefferson County, Aladdin Oil Co.'s 1 Humphrey well was abandoned after finding very little Oriskany Devonian sand.

This interesting wildcat was drilled on the Hebron anticline in an area where Oriskany sand was thought to be absent. It was the first wildcat to be drilled north of the Sabinsville anticline since production was found in the Boone Mountain pool.

The Hebron anticline is the next one northwest of the Sabinsville anticline and parallel to it. Production in Boone Mountain pool was opened on the flank of the Sabinsville anticline after a dry hole which found the Oriskany absent was drilled on the axis of the same anticline. The second location made by Aladdin has been abandoned and no further drilling in this area by the company is anticipated at present.

Boone Mountain. Development drilling here continues with the completion of a number of gas producers averaging about 8 M.M.c.f.d.

Northumberland. The Hillbush wildcat in this county is drilling at 3,459 ft. Considerable leasing has been done in the area and the well is being watched with considerable interest.

Westmoreland. The most significant activity during the past month occurred in eastern Westmoreland County on the Laurel Hill anticline about 9 miles northeast of Johnstown field.

A wildcat by Felmont Oil Co. was drilled at this location. It found the Onondaga Devonian chert at 7,407 ft. and 1 M.M.c.f.d. It is shut down to be fractured now.

The Laurel Hill anticline has been leased for miles by Pennsylvania operators and major oil companies new to the area. This well looks like a commercial producer and should stimulate considerable drilling on this structure.

East Kentucky deep well is disappointment

Another deep test in eastern Kentucky has ended in disappointment as United Fuel Gas Co. has plugged and abandoned its 1-A Knuckles. Located east of Pineville in Bell County, the test was drilled to a total depth of 10,034 ft. Although no formational tops have been released, well was especially interesting in that it was drilled a short distance from the outcrop expression of the Pine Mountain fault—the dominant geological feature of southeastern Kentucky.

Canyon is new pay in Aspermont area in Texas

Canyon Pennsylvanian sand production was opened in Aspermont Ellenburger and Strawn reef field in Stonewall County, West Central Texas.

The new discovery well is 1 I. S. McMillin A/C 6, Section 20, Block U, T&P Survey, 7 miles south of the town as Aspermont. It flowed 275 bbl. of oil per day on 20/64-in. choke from perforations at 4,354-64 ft. The oil was 3.5% water.

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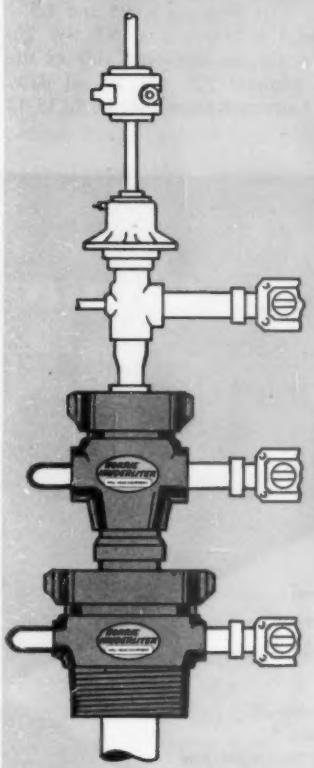

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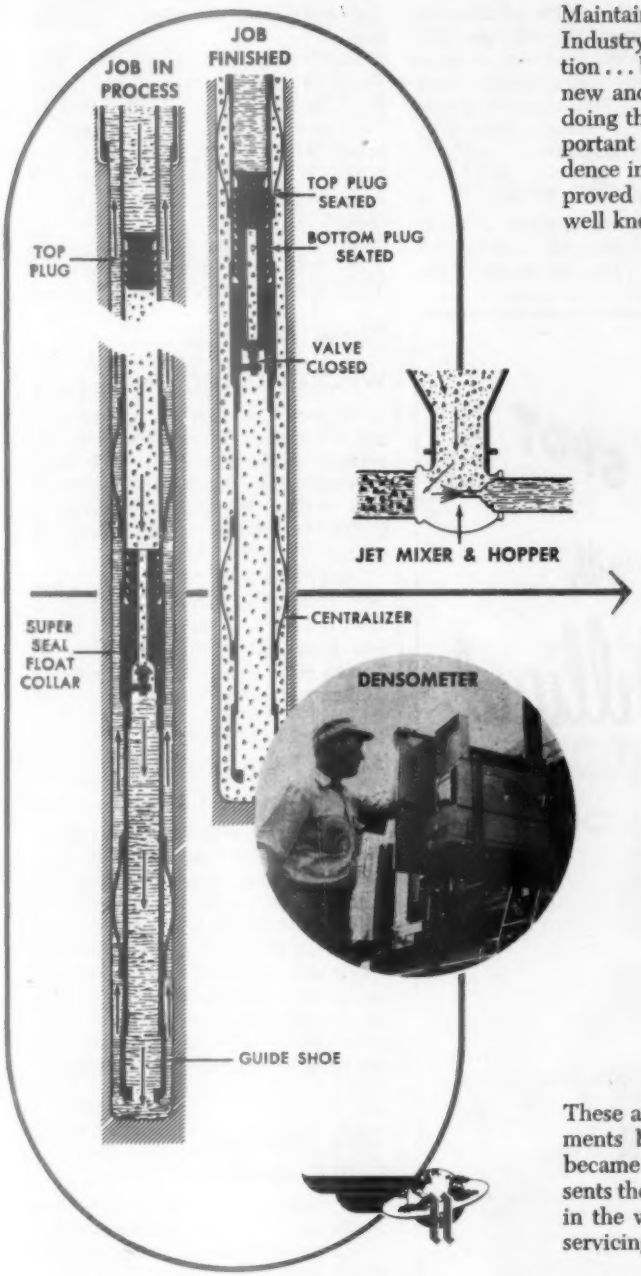

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Area news. Other events in West Central Texas included a Gardner sand discovery in southwestern Shackelford County. It is West Central Drilling Co.'s reentered wildcat, the 1 Mrs. W. G. Green et al., 12 miles southwest of Albany in the southwestern part of the county.

This Gardner sand well flowed 93 bbl. per day through 13/64-in. choke from perforations at 3,669-72 ft. Location is Section 68, Block 12, T&P Survey. Nearest Gardner sand production is 1 mile west. This well was drilled in 1946 by Standard Oil Co. of Kansas to 5,005 ft. It was there abandoned.

Jones County. Cook sand production was opened in Strole Palo Pinto field in Jones County. The discovery well is Geochemical Surveys 1 D. G. Strole in Section 43, Block 14, T&P Survey, 4.7 miles north of Hamby. The well pumped 60 bbl. per day from perforations in Cook sand at 1,778-80 ft. It was originally completed as a Palo Pinto zone discovery.

Tests continue at Panhandle well

TESTING CONTINUES at a 3-mile extension to Panhandle field in Carson County, Texas Panhandle. The discovery well is Consolidated Gas & Equipment Co. 1 Delmer Urbanczyk in Section 75, Block 7, I&GN Survey, 7 miles northeast of Panhandle, 3 miles west and 5 miles south of Panhandle field gas and oil production.

The Permian well flowed more than 10 M.M.c.f.d. through open tubing from perforations at 2,980-3,000 ft. This new discovery is the latest in events south of the Panhandle field limits. A recent wildcat in the area 12 miles southwest of Urbanczyk well flowed 9,500 M.c.f.d., 2% helium, from Brown Permian dolomite at 3,247-3,400 ft. That well was the Texas Gulf Production Co. 1 Bobbitt.

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New Mexico wildcat completed

A REMOTE WILDCAT opened Gallup Cretaceous oil production in the extreme southern part of New Mexico's San Juan basin. The discovery well is Otto Reynolds 1 Belknap in C NE SE 13-19n-6w, McKinley County.

Oil flowed at the hourly rate of 4½ bbl. from perforations at 3,312-60 ft. Location is 1¾ miles southwest of Star Lake and 12 miles northwest of Torren. There has been little previous drilling and production in this part of the basin.

Atoka Penn gasser finaled in Lea County

Southeast New Mexico's Lea County has new Atoka Pennsylvanian production at Texaco Inc. 1-CH State, 26 miles southwest of Monument. The well flowed 49 bbl. of oil daily from 12,640-54 ft. on 22/64-in. choke and 1,413 M.c.f.d. From Morrow the well got 41 bbl. condensate through choke on earlier tests. Location is 5 miles southwest of Teas field and 4 miles southeast of Halfway field in 36-20s-32e.

Ohio adds two Clinton gas pools

In Ohio, Ira Porter reports two additions to the new Clinton gas pool in northwest Westfield Township, Medina County.

A half-mile stepout 1 Lloyd Porter, Lot 23, gaged 197 M.c.f.d. natural and increased to an estimated 3 M.M.c.f.d. after fracture with a rock pressure of 870 psi. Natural gage of the 2 Lloyd Porter, Lot 14, was 1,040 M.c.f.d., with a rock pressure of 1,050 psi. in 18 hours.

The Clinton sand was logged at 3,209-32 ft. and 3,162-73 ft. respectively.

Patrick Draw moves north in Wyoming

WYOMING'S prolific Patrick Draw Almond sand Cretaceous field continues its northward march. Gulf Oil Corp. 1 Chorney-State in C SE NE 36-19n-99w, most northerly well in the Green River basin field, flowed 1,011 bbl. daily on 24/64-in. choke.

Production is from Almond at 5,077 ft. through a notch. Location is 1½ miles southwest of Forest Oil Corp. and Union Pacific Railroad 19-1 Arch Unit-2, C SE SW 19-19n-98w, Sweetwater County. That well is being tested in Almond.

Pennsylvanian strike finaled in Powder River

Northeastern Wyoming came up with another Minnelusa Pennsylvanian oil find last week with completion of a wildcat in Campbell County, 1½ miles northwest of North Donkey Creek Dakota Cretaceous field.

This new pool opener is Hondon Oil & Gas Co. 1 Federal in SE NE 13-50n-69w. It was pumping 100 bbl. of oil daily on completion, cut 6% water from perforations at 7,902-42 ft. Gravity is 19°.

Nearest similar production is at the north end of Donkey Creek field, 3 miles southeast.

Other basin news. An oiler was completed at the south end of Miller Creek field in Crook County. It is Trigood Oil Co. 3 Arcol-State in SW NW 16-51n-68w. It flowed 550 bbl. per day from Dakota Cretaceous perforations at 6,038-45 ft. No choke size was reported. Earlier, however, the well had flowed 23 bbl. hourly on ⅜ and 7/16-in. chokes.

Trigood's new well is the southernmost well in the field. Location has been made for another well to the south at 4 Arcol-State in NW SW 16-51n-68w. To the west Mobil Oil Co. has two indicated hits in 17-51n-68w. The 41-17 Government in NE NE 17 is flowing after swabbing got 20 bbl. of oil in 1½ hours. A southwest offset, another Mobil well, is rigging up separater after swabbing 19 bbl. of oil, 0.4% water in 16 hours. Shell Oil Co. will drill a well at 43-17 Baum in NE SE 17.

New producing area for Kansas' Ford

SOUTHWEST Kansas' Ford County has its fourth producing area as a result of succesesful Marmaton oil finds at Tennessee Gas Transmission Co. 1 Barngrover in NE SE SW 26-27s-24w.

The Marmaton Pennsylvanian oil discovery is 6 miles southeast of Dodge City in Ford County. It swabbed 6 bbl. of oil per hour from 4,874-83 ft. Potential is now being awaited on pump.

Ford County has only three fields currently producing. They are Helmers Mississippian gas field in 25-28s-21w, Konda Mississippian oil field in 11-27n-22w, and Pleasant Valley Mississippian oil and gas field. None of these is closer than 10 miles from Barngrover. Pleasant Valley was opened in April 1959, for 48 bbl. of oil per day and 6,300 M.c.f.d. by Sinclair Oil & Gas Co.'s 1 Young well. Helmers field has only one producer, a 1953 discovery of M. B. Armer at 1 Helmers. Potential was 5,682 M.c.f.d. Konda has only one well, opened by Pure Oil Co. at 1 Konda in 1956. It pumped 52 bbl. per day.

Mancos discovery hit in San Juan's McKinley

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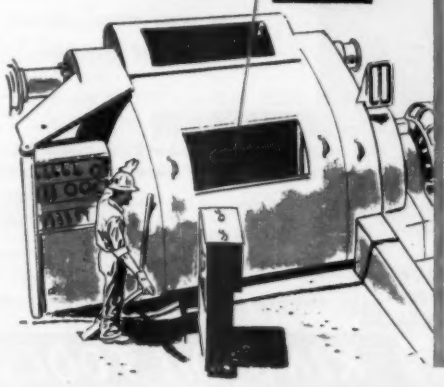

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McKinley County, northwestern New Mexico.

The San Juan basin wildcat flowed 24 bbl. of oil hourly on 7/64-in. choke from perforations at 2,902-40 ft.

Rio Arriba. A Tocito-Sanastee discovery was completed in this county by Intex Oil Co. The 1 Bajo in C SE NW 9-26n-1e pumped 28 bbl. of oil daily from open hole at 1,996-2,357 ft. Top of the Tocito or Mancos was 1,960 ft.; Sanastee at 2,321 ft. This is a new pay for the area. Closest production is at Intex 1 Alto, 1½ miles northwest, a recently completed significant Niobrara Cretaceous discovery that made 130 bbl. per day,

Nebraska has three new Ackman sites

THREE NEW LOCATIONS were staked in Nebraska's Ackman field, the most active area in the state. This Red Willow County field, in the Kan-Neb basin, is one of the most successful Pennsylvanian fields in the basin. It was opened last year at Frontier Refining Co. 1 Reiners in NW NE SW 15-2n-28w. Production is from Lansing-Kansas City.

The new pay discovery for the field, 2 Reiners, was completed this year in C SE SW 14-2n-28w. It produces from Oread Pennsylvanian. Frontier will drill 3 Hoffman on the north side of the field in NW SE 11-2n-28w. The 4 Reiners-C will drill in SW NW 23-2n-28w at the south end of the field. The 4 Hoffman will drill in C SW NE 14-2n-28w in the center of the field. There are 13 wells staked, drilling, or testing in the field.

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Arizona confirmation flows gas on tests

A southeastern extension to last year's Mississippian oil discovery in Apache County, northeastern Arizona, flowed gas on drill-stem tests. It is Texas Pacific Coal & Oil Co.'s well. Gas flowed at the daily rate of 1,350 M.c.f. Production at the discovery well was oil.

New Mexico has big wildcat find

ONE of the year's most important wildcat discoveries was completed in southeastern New Mexico's Eddy County, 15 miles west of Malaga.

This significant find, Gulf Oil Corp. 1-AD Federal-Estill, is located at the very edge of the northwestern part of Delaware basin in remote wildcat country. Location is 3 miles southwest of Black River field and 2½ miles northwest of a lone Pennsylvanian gas well.

The Eddy County wildcat was completed for a calculated absolute open flow of 46,857 M.c.f.d. plus 4.2 bbl. of condensate per 1 M.M.c.f. of gas. Gravity is 58.4°. Flow was through an unidentified zone at 9,806-16 ft. through perforations. It is in 29-24s-26e.

Southeast New Mexico wildcat is discovery

Morrow Pennsylvanian gas-condensate production was opened at Robinson Bros. Oil Producers' 1 Mary Elliott in southeastern Chaves County, 7 miles southwest of Caprock.

The well flowed 10 M.M.c.f.d. and 50 bbl. condensate per 1 M.M.c.f. Flow was through perforations in the Morrow Pennsylvanian at 10,870-10,910 ft. Total depth is 11,000 ft. Location is 3½ miles southeast of Apache Springs field and ¾ mile southeast of a dry hole at 11,279 ft. in 22-11s-31e.

Lea County. Another Morrow discovery is Texaco Inc. 1-CH State of New Mexico, 26 miles southwest of Monument. It flowed 3,526 M.c.f.d. and 114 bbl. condensate. Flow was from deep perforations at 13,242-66 ft.

Three significant British Columbia wildcats showing promise

EXPLORATION in northeastern British Columbia once again highlighted activity throughout western Canada. Three wells in the "hot spot" of that province—the northeastern sector—near Fort Nelson townsite are nearing their answers in the Slave Point.

None of the three tests have as yet made discovery in the horizon but all have encountered porosity in the top portion of the horizon, which in the case of the Slave Point, usually indicates production. Operators of the ventures, however, are fairly confident of success as they are making certain all precautionary measures are undertaken before going into the usual high pressure formation. Protective string of casing has already been set on a pair of the tests and the third well is presently undergoing that treatment.

Phillips. Two of the wells are being drilled by Phillips Petroleum Company. One of them is in the Kledo Creek district 27 miles due west of Fort Nelson townsite. Present total depth of the hole is 9,966 ft. and casing is being run to that vicinity. A remote wildcat, it lies 40 miles west-northwest of the Gulf States C-78-I Clark Lake venture that found 364 ft. of gas pay in the Slave Point, and 16 miles southwest of the closest previous test, Gulf State's 1 Evie Lake exploratory abandonment.

The other, meanwhile, Phillips A-25-D Minnaker, if completed successfully in the Slave Point would be one of the two most southerly completions in the horizon in northeastern British Columbia—the other being the Imperial-H. B. Paddy well 95 miles due east. It is 3 miles north of Trutch town site and 75 miles south of Fort Nelson. It has been cased to a depth of 9,555 ft. and deepening operations are scheduled to start in the near future.

The Kleo well is being drilled on a permit block comprising a total of 47,613 acres in which Canada Southern Petroleums, Ltd., West Canadian Oil & Gas, Ltd., and Scurry Rainbow Oils, Ltd., also have interests. On the other hand, the Minnaker venture is situated on Petroleum and Natural Gas Lease rights selected out of Permit. No. 94.

Cam Lake. Pan American Petroleum Corp. is operator of the other hole currently holding the attention of the industry.

The wildcat is considered to be a very important link in Slave Point development in the far northern reaches of the province and the southern Northwest Territories. Reason for its importance is that it lies almost midway between the Gulf States Petitot River gas discovery well and the recent Home Oil Co., Ltd., operated Celebita Lake Slave Point discovery in the Northwest Territories. Only 30 miles separates those two extremely interesting and highly productive gas strikes and the venture is 11½ miles northwest of the Petitot River find.

This well, Pan American C-31-I, Cam Lake, is 85 miles north of Fort Nelson 5 miles south of the N.W.T.-B.C border and lies on Permit 384, a tract of 108,208 acres acquired under agreement from British Columbia Oil Lands, Ltd.

String of protective casing was run in it to 6,756 ft. and coring operations were in progress at last report.

Gas condensate find extends Texas trend

A NEW gas-condensate discovery by Socony Mobil Oil Co. in Lavaca County extends South Texas' "Deep Edwards" trend nearly 60 miles northeastward.

It is 30 to 35 miles coastward and downdip from the much older Balcones and Luling fault-zone trend of fields productive from the Edwards.

Pay zone at 13,320-14,278 ft. is the second deepest at which the Edwards has proved productive so far. It is exceeded only in one well, located at Lowe Ranch, far southwest in McMullen County. There the pay is in open hole with total depth of 14,479 ft.

The new well, 1 Sylvia W. Kahanek, is rated good for 3,600 M.c.f.d. of gas. Gas condensate (52.2°-gravity) ratio is 14,200 cu. ft. per bbl. Actual flow was at the rate of 1,300 M.c.f.d. through ¼-in. choke with pressure of 1,400 psi.

Location is in the old Word area, 6 miles southwest of Halletsville, where Wilcox sands at 5,900 ft. have been productive since 1944.

The extension from the more updip fields along the Balcones and Luling fault-trend moves Edwards production to the borders of the oil and gas-rich Gulf Coast region, long and densely productive from geologically shallower Tertiary horizons.

Nearest of the deeper Edwards fields is at Person, in northern Karnes

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Well completions, footage

The March summary of well completions and footage drilled, which ordinarily appears in this, the last issue of the month, was published in the April 18 issue, page 200.

County. That field, opened last August, as the first and so far only one to produce oil, extended the trend of fields nearly 20 miles.

Production at Person is from two zones at 10,900-ft. Twelve wells have been completed so far in one of the more active localized development programs along the trend. A major extension well has just been completed by Shell Oil Co. about a mile northwest in its 1 Pawelek, flowing 160 bbl. of oil daily through 12/64-in. choke. Its pay is perforated at 10,974-86 ft.

Rio Grande well opens new pay

Another zone has proved productive in Monsanto Chemical Co.'s new deep gas-condensate discovery well off the southeast end of Barrosa field in eastern Starr County, in Texas' Rio Grande Valley.

Perforated at 7,200-12 ft., acidized, and fractured, it flowed at the daily rate of 1,390 M.c.f. of gas and 10 bbl. of condensate while cleaning through ¼-in. choke.

Previous tests (O&GJ, April 18, 1960, page 197) were in a deeper pay at 7,625-50 ft. From that sand the well flowed 3,340 M.c.f.d. of gas, plus 10 bbl. of condensate, through ¼-in. choke. Rated open-flow potential is 14,000 M.c.f. per day.

The well now is being dually completed. Both zones are in the Frio-Vicksburg section. Location is 20 miles northeast of Rio Grande City.

Bend well finaled in Parker County, Texas

North-central Parker County, North Texas, has a new Bend conglomerate gas discovery. Finder is Lone Star Production Co. Discovery well is the 1 J. W. Sturdivant, 3 miles northwest of Springtown in the John Montgomery Survey, A-878, 1½ miles west of Springtown Caddo field.

The well flowed 6,100 M.c.f.d. absolute open 24-hour flowing potential from perforations at 5,290-5,300 ft.

Fisher County. A swastika oil discovery is reported by Fletcher Oil & Gas Drilling Corp. at the 1 Alexander "C," 4 miles north of Hamlin, northeastern Fisher County, Texas.

The well flowed 71 bbl. of oil through ½-in. choke on 2-in. tubing set at 3,560 ft. Perforations in Swastika were at 3,623-24 ft. Location is in Section 8, Austin & Williams Survey No. 349.

Crane County field gains second producer in Texas

The second Wichita Albany well for Running W field in Crane County, West Texas, is Gulf Oil Corp. 60 M. B. McKnight, 11 miles southwest of Judkins. The well flowed 31 bbl. of oil per day on 11/64-in. choke from open hole section at 5,300-5,456 ft. Location is 1 mile south of the field discovery. It is in Section 2, Block B-21, PSL Survey.

Texas Gulf well has gas-condensate flow

A rich gas-condensate discovery is indicated in a wildcat drilled by Michel T. Halbouty about 7 miles northwest of Garwood, in Colorado County, on the Texas Gulf Coast.

Discovery well, 1 William K. Lehrer, made a heavy flow of gas for 12 hours while cleaning through 12/64-in. choke from perforations at 8,947-54 ft. No gage of volume was taken but tubing pressure held at 2,200-50 psi. Top pressure with the well shut in is 3,060 psi.

Nearest other production is in Mustang Creek field, 3 miles northeast.

Extensions drilling in Texas' Cass County

Two confirmation and extension tests already are drilling in the Bryans Mill area of northwestern Cass County, northeastern Texas, where Shell Oil Co. recently opened gas-condensate production from the deep Jurassic-Smackover formation.

Newest operation is a 2¾-mile northwest stepout from the discovery well. It is Shell's 1 Annie Brock, a projected 12,000-ft. well being drilled by Travis Ward, Athens, Tex.

This is 4,300 ft. southeast of a previously started extension test at 1 J. M. Lasater. The latter is being drilled by Jet Drilling Co., Inc., of Denver.

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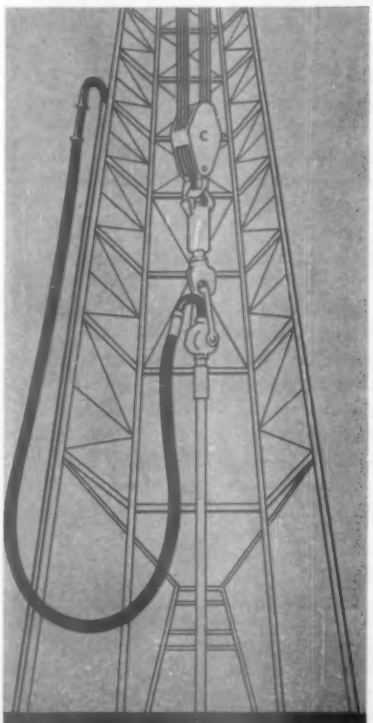

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has the Smackover pay at 10,297-10,367 ft. It tested for an open-flow potential rating of 22 M.M.c.f.d. of gas with condensate recovery of 233 bbl. per M.M.c.f.

Another Jurassic test is being drilled about 3½ miles southeast of Shell's development. Its operators are Happy Gist and Maxwell Herring Drilling Co. with the latter's rig doing the work.

Louisiana discovery being confirmed

A recent Tuscaloosa gas discovery by F. W. Wilson in the Trenton area of DeSoto Parish, North Louisiana, is being confirmed in a 3,100-ft. southwest offset drilled by Dorcheat Drilling & Development Corp.

Dorcheat's new well, 1 Turner, in 35-11n-13w, has a calculated open-flow potential of 4 M.M.c.f.d. of gas. Flow through ¼-in. choke with pressure of 641 psi. was 1 M.M.c.f.d. Pay is perforated at 2,874-76 ft.

Discovery well, 1 Thigpen, is rated at 3,500 M.c.f.d. of gas with its Tuscaloosa pay perforated at 2,796-2,811 ft.

Texas' Jasper gets small oil completion

Completion of a small oil-discovery well in Jasper County, southeastern Texas, is reported by Atlantic Refining Co.

Location is 6 miles east of Evadale. Nearest production is in Adams Ranch field, 6½ miles southeast. Atlantic suggests "Bunker Hill" for the name of the new field.

Discovery well, 1-C Kurch, in the George Johnson Survey, flowed 23.83 bbl. of 45.8°-gravity oil per day through 12/64-in. choke. Its pay is perforated at 8,573-82 ft. Flowing pressure was 400 psi. with gas-oil ratio of 12,200 cu. ft. per barrel.

Wildcat slated between two Oklahoma producers

In southern Oklahoma, Sinclair Oil & Gas Co. will drill between the discovery well at West Moss and the extension well to the northwest at 1 Hassen Estate in NE NW NE 12-1s-2e, Murray County.

Sinclair's new test will go to 4,000 ft. Sohio Petroleum Co. 1 Hale in NE SE SW 1-1s-2e perforated the basal Oil Creek sand of Ordovician age at 3,872-74 ft. It completed flowing 52 bbl. of oil per day on 7/64-in. choke. West Moss pool was opened by Falcon-Seaboard at 1 Fisher in SE

(Continued on page 257)

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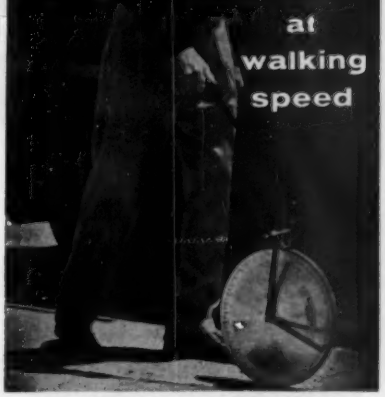

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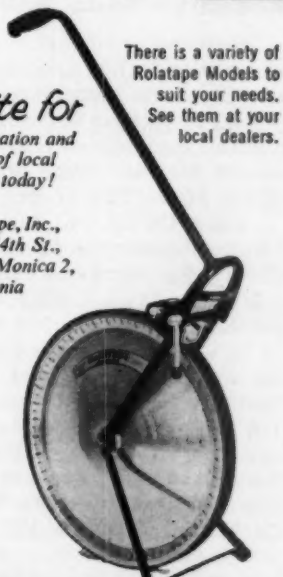

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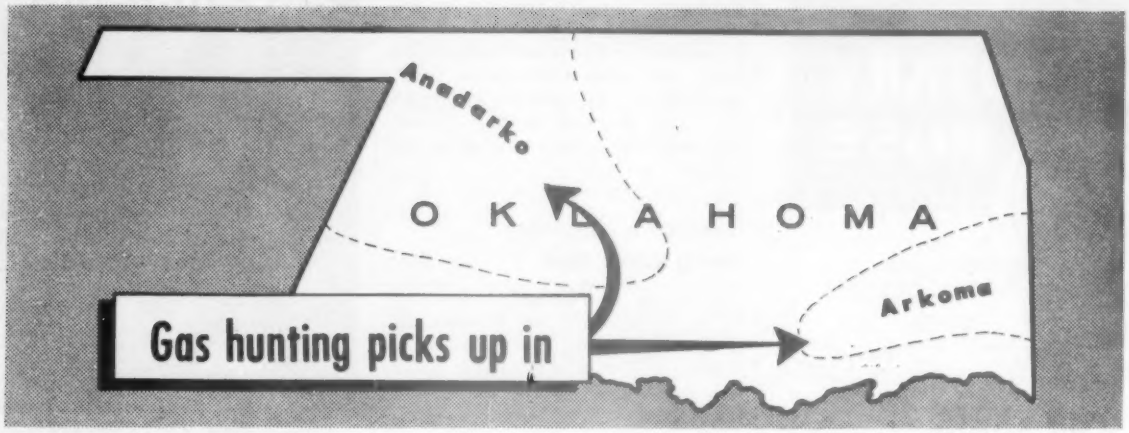

Sooner gas frontiers widen scope

THIS IS gas-hunting year in Oklahoma. Explorers in the eastern part of the state are vying with their counterparts in the northwestern section for what will probably be the big year for gas. Two far-apart basins, Anadarko and Arkoma, are in the midst of the most concentrated exploratory effort in Sooner gas development. The search is not new, but intensified in the Anadarko basin, while Arkoma is on the threshold of its first real splurge into the producing column.

Anadarko Basin Drilling

. . . continues to emphasize the new value of gas exploration in the Mid-Continent. With the best exploratory decade in history behind it, Anadarko is busy proving up previous discoveries and tapping additional reserves. Particular areas to watch this spring are both sides of Washita County, all of Custer County, Dewey, Blaine, Major, Ellis, Harper, and Woodward counties.

Eason Oil Co. will try a confirmation to a recent Chester Mississippian discovery in 27-19n-10w, Blaine County. Pan American Petroleum Corp. 1 Houk in 8-21n-15w, Major County, originally thought to be a gas discovery, flowed 150 bbl. of oil in 8 hours on ⅜-in. choke from Chester at 7,485-7,546 ft. Earlier the well flowed 10 M.M.c.f.d. Beckham County's North Carter field was extended by Wilcox Oil Co. at 1-A Duggins with 22 M.M.c.f.d. and 50 bbl. condensate reported on tests of Des Moines Pennsylvanian. Busy Ellis County areas are South Fargo, North Linscott, and South Goodwin fields. Sinclair Oil & Gas Co. has linked Laverne and Stockholm fields in Harper County. All of these wells and areas will go a long way toward proving the northwestern Anadarko basin as one of the world's gas storehouses.

Arkoma Basin Comes Alive

. . . with operators planning the biggest year yet in one of the most youthful provinces in the nation. Reports state that five companies hold nearly 800,000 acres of leases in an eight-county area of eastern and southeastern Oklahoma. These leases cover all or portions of Latimer, Haskell, LeFlore, McIntosh, Pittsburg, Pushmataha, Sequoyah, and Muskogee counties. Arkoma acreage includes 185,000 acres by Mobil, 182,000 by Humble, 142,000 by Pure Oil Co., 128,000 acres by Pan American, and 117,000 to Shell Oil Co. Several other operators hold considerable acreage in the basin and its edges.

Drilling interest now centers at Midwest Oil Corp. 1 Orr in 8-6s-22e, Latimer County, where gas production was found in the middle Atoka Red Oak and basal Atoka Spiro Pennsylvanian sands at 7,200 and 11,500 ft. The 1 Foster, a new test in 7-6n-22e, will dig to 11,700 ft. Apache Oil Corp. opened basal Atoka gas production at 1 Williams in 14-8n-19e, Haskell County, west of Kinta field. That well flowed 8 M.M.c.f.d. Apache is drilling a south offset. Ambassador Oil Co. is drilling a north extension. Shallow Atoka sand gas production (1,040 M.c.f.d.) was opened at Bell Oil & Gas Co. 1 Young in 11-11n-18e, McIntosh County.

Not Much Land is Left

. . . along the frontal fault system that cuts through the Arkoma basin. Most of the drilling in the basin is and has been down to the Atoka beds which thicken and deepen southeastward from Kinta and Norris into Arkansas. The fault system that complexes the basin is expected not to hinder gas-finding due to Sinclair Oil & Gas Co.'s recent discovery in 32-3n-20e. One of the nation's most complex and promising basins awaits the drill in 1960.

—John C. McCaslin

NE NE 12-1s-2e. It pumped 60 bbl. of oil and 90 bbl. water from basal McLish perforations at 2,848-57 ft.

Carter County. Samedan 1 Wood was completed in NW SW NE 27-2s-2w, Carter County, for 42 bbl. of oil in 14 hours on pump from perforations at 1,462-92 ft. The 2 Wood in SW SW NE 27 has casing set at 1,643 ft. Total depth is near at the 3 Wood in SE SW NE 27. Kingery Production Co. 3 Wood in SE NE NW 27 pumped 60 bbl. of oil per day from perforations at 1,561-71 and 1,588-91 ft.

Discovery wells

ARKANSAS

Calhoun County:

Hughes & New Oil Co. 6-A Protez & Barton, 2-16s-14w. IPP 45 BOPD, 19°, perf. 2,595-97 ft., Graves sand. TD 2,648 ft. New pay in Cross Country Slough field.

Lafayette County:

Austral Oil Co., Inc., 1 IPCO (5915), 34-19s-24w, 4 miles southeast of Bradley. IP 384 BCPD, 2,784 M.c.f.d., 27/128-in., 55.3°, TP 7,250 psi., perf. 11,005-25 ft., Smackover. TD 11,365 ft. Discovery well Lake Erling field.

WESTERN CANADA

Alberta:

Amerada et al. 6-12 Willisden Green West Crown, LSD 6, 12-42-7w5. Cardium oil discovery. TD 6,550 ft.

CPOG 7-11 Jarrow, LSD 7, 11-45-10w4. Gas discovery. TD 2,630 ft.

NORTH LOUISIANA

Webster Parish:

Wheless Drilling Co. 1 Hough, 21-19n-8w. IP 2,100 M.c.f.d., 20 BCPD, 16/64-in., 52°, TP 1,582 psi., perf. 7,562-76 ft., Paluxy (Youngblood sand), and 2,600 M.c.f.d., 16 BCPD, 16/64-in., 52°, 1,970 psi., perf. 7,419-31 ft., Paluxy (Hough sand). TD 7,781 ft. New pay in Minden field.

SOUTH LOUISIANA

Allen Parish:

J. P. Owen 1 Hammie Guidry, 28-5s-2w, 3¾ miles southeast of Caster Creek field. IP 120 BOPD, 8/64-in., 38°. TP 1,300 psi., GOR 800 cu. ft. per bbl., perf. 7,825-31 ft. TD 8,212 ft. New-field discovery.

MISSISSIPPI

Clarke County:

Broadhead & Stack 1 Land, SE NE SW 10-2n-16e. IPP BOPD (net), 5 BWPD, 15°, perf. 3,624-31 ft., 3,694-3,700 ft., and 3,737-42 ft., Eutaw. TD 4,157 ft. Reopens abandoned Quitman field.

Walthall County:

Sun Oil Co. 1 J. O. McDonald, 26-3n-11e. AOF 23,500 M.c.f.d., dry gas (flowed 4,270 M.c.f. in 22¾ hours, 13/64-in., 15.2 BW, TP 4,180 psi.), perf. 13,120-23 ft., 13,130-43 ft., 12,938-60 ft., Paluxy. TD 13,891 ft. Elev. 359 ft., Lower Cretaceous 10,250 ft., Paluxy 12,598 ft.

NEW MEXICO

Eddy County:

Sunray Mid-Continent Oil Co. 1-Q New Mexico State, 11 miles northeast Carlsbad in 32-19s-29e. IPCAOF 700 M.c.f.d., Atoka 10,886-10,908 ft. TD 12,429 ft. New gas discovery.

EAST TEXAS

Delta County:

Walter C. Best and R. L. Gibson 2 V. R. Young, John Haze Sur., 10 miles east of Cooper. Calculated open-flow potential 5 M.M.c.f.d., sweet gas, 7 BC per M.M.c.f., perf. 6,918-25 ft., Smackover. TD 7,100 ft. New-field discovery—first in county.

TEXAS GULF COAST

DeWitt County:

Harkins & Co. 1-A D. H. Heaton, Manuel Manchaca Sur., A-334, 15 miles southeast of Yoakum. IP 58 BOPD, 7/64-in., 46°, TP 1,210 psi., Gor 3,530 cu. ft. per bbl., perf. 4,984-89 ft., Yegua. TD 8,018 ft. New-field discovery.

Hidalgo County:

Shell Oil Co. 3 Hamman Ranch, San Salvador Del Tule Grant, 4 miles northwest of Monte Christo. AOF 2,500 M.c.f.d., GLR 161.7 M.c.f. per bbl., 55.9°, shut-in TP 2,765 psi., perf. 7,266-74 ft., Frio. TD 8,105 ft. New pay in Monte Christo field

Jefferson County:

Texaco Inc, 1 Park Place Gas Unit, Lot 6, Range J-7, Port Arthur Land Co. Subd., Joseph Butler Sur., A-9, in Port Arthur city limits. AOF 10,400 M.c.f.d., GLR 7,721 cu. ft. per bbl., 52.2°, shut-in TP 7,310 psi., perf. 13,980-85 ft. and 13,994-14,004 ft., Vicksburg. TD 10,050 ft. New pay in Port Arthur field.

Lavaca County:

Robert Mosbacher 1 Gus E. Cranz et al., Eusebio Farias Sur., A-170, 5 miles east of Ezzell. AOF 4,850 M.c.f.d., GLR 52 M.c.f. per bbl., 50.4°, shut-in TP 2,672 psi., perf. 8,040-48 ft., Wilcox. TD 8,259 ft. Discovery well Southwest Speaks field.

Liberty County:

Sun Oil Co. 2 Stone, Jose Delgado Sur., A-177, 5 miles southwest of Sour Lake. IP 132 BOPD, 7/64-in., 44.1°, TP 4,300 psi., GOR 7,550 cu. ft. per bbl., perf. 11,817-34 ft., lower Yegua. TD 12,514 ft. New pay in Hathaway field.

Matagorda County:

M-P-S Production Co. et al. 1 George Krueger, A. W. Mangum Sur., A-362, 7 miles northwest of Bay City. AOF 11,500 M.c.f.d., dry gas, shut-in TP 2,407 psi., perf. 6,722-26 ft., Marginulina. TD 6,835 ft. Discovery well West Chamners field.

Humble Oil & Refining Co. 1 First City National Bank of Houston, Block 15, M. B. Nucklos Sur., A-66, 12 miles southeast of Bay City. IP 3,600 M.c.f.d., ¼-in., 66.7 BC per M.M.c.f., TP 2,000 psi., Perf. 12,034-68 ft., Frio. TD 14,012 ft. New-field discovery 2 miles south of Old Ocean field.

Lloyd H. Smith and Michel Judd 1 Alderman Unit, Lot 21, Block 2, G. J. Williams Sur., A-103, 4½ miles southeast of Blessing. Shut-in gas well, no gage, perf. 11,078-90 ft., Frio. TD 11,257 ft. New-field discovery.

Nueces County:

Golden Falcon Oil & Gas Co. 1 Donigan, Section 7, Range VI, Kinney Lands, 2 miles east of Clarkwood. AOF 45,500 M.c.f.d., GLR 27.4 M.c.f. per bbl., 52.5°, shut-in TP 4,053 psi., perf. 9,417-37 ft. and 9,442-69 ft. TD 10,025 ft. New pay in East Saxet field.

TEXAS PANHANDLE

Hansford County:

Stekoll Petroleum Corp. 1-125 Jackson, 2 miles south of Gruver, 1¼ miles southwest of oil production and 2¼ miles southwest of gas in North Hansford field, Sec. 125, Blk. 45, H&TC Sur. IPCAOF 5,200 M.c.f.d., Upper Morrow 7,050-60 ft. TD 7,660 ft. Gas discovery.

Ochiltree County:

Shamrock Oil & Gas Corp. 1 Calvin Flowers, 22 miles south of Perryton in Sec. 135, Blk. 43, H&TC Sur. IPP 69 BOPD, 40°, Cleveland 7,486-92 ft. TD 9,242 ft. Oil discovery.

WEST CENTRAL TEXAS

Coleman County:

Dugger & Herring et al. 1 L. W. Stevens et al., 10 miles northeast of Coleman in James Bradshaw Sur. IPP 31 BOPD, 42°, GOR 340:1, plus 10% water, Marble Falls 2,622-88 ft. TD 2,693 ft. New oil discovery, prorated in Regular field.

Eastland County:

Hayden Farmer 1 A. Hutchins, 10 miles northwest of Rule, Sub. 2, A. Slaydon Sur. A-58. IPP 52 BOPD, plus 8% water, 40°, GOR 450:1, Jud sand open hole 4,972 ft. TD 4,981 ft. New oil discovery.

Throckmorton County:

American Petroleum Co. of Texas 1 J. F. Grable, OWDD, 7 miles east of Throckmorton in Sec. 2187, TE&L Sur. IPF 419 BOPD, 12/64-in. choke, 40°, GOR 540:1, CP 510 psi., TP 250 psi. Miss. lime 4,843-48 ft. TD 4,850 ft. New oil discovery.

WEST TEXAS

Crane County:

Gulf Oil Corp. 59 M. B. McKnight, 22 miles northwest of Crane in Sec. 24, Blk. B-17, PSL Sur. IPF BOPD, 22/64-in. choke, open hole Wichita Albany 5,356-5,460 ft., 35.1°, GOR 578:1, TP 155 psi., CP 635 psi. TD 6,260 ft. New oil discovery.

Dawson County:

Tennessee Gas Transmission Co. and Husky Oil Co. 1-A E. M. Dupree, 9 miles northwest of Lamesa in Sec. 41, Blk. M, EL&RR Sur. IPF 428 BOPD, 9/64-in. choke, 39.8°, Fusselman 11,670-11,735 and 11,754-78 ft. TD 12,180 ft. New oil discovery.

Ward County:

Norwood Oil Co. and Amarillo Oil Co. 1 Anna Herring, 6 miles south of Pyote, Sec. 94, Blk. 34, H&TC Sur. IPF 193 BOPD, 22/64-in. choke, 39.5°, Cherry Canyon 6,109-34 ft. TD 6,145 ft. New oil discovery.

Yoakum County:

Williamson, Hamon, and U. S. Smelting, Refining, and Mining Co. 1 Brown, 4 miles west of Plains in Sec. 446, Blk. D, J. H. Gibson Sur. IPF 305 BOPD, 18/64-in. choke, 39.8°, Mississippian 10,882-10,904 and 10,930-52 ft. TD 11,510 ft. New oil discovery.

WYOMING

Fremont County, Sage Creek area:

Amerada Petroleum Corp. 1 Wind River "A," NE NE SE 20-1n-1w. IPP 2 BOPD, 765-795 ft. TD 2,060 ft. Red Peak discovery, new pay.

Johnson County:

Texaco Inc. 1 State, SW SW 13-44n-82w. IPP 358 BOPD, Tensleep 6,530 to 6,642 ft. TD 6,767 ft. Tensleep discovery, new field.

Natrona County:

Davis Oil Co. 1 Federal-Burke, C NW NW 1-36n-79w. IPF 274 BOPD, 20/64-in. choke, second Frontier 6,013-17, 6,028-35 ft. TD 6,098 ft. New field.

Wildcat wells—1959 depth classification breakdown

	OIL									GAS									DRY								
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Alabama	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	7	3	2	4	3	2	1	..
Arizona	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	7	3	3	6	4	..	..	..	..
Alaska	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	4	2	..
Arkansas	..	..	8	2	3	2	..	..	..	..	..	2	2	3	1	1	..	..	5	11	61	15	20	10	..	..	..
California	1	4	2	2	3	10	6	4	..	1	2	4	3	15	2	..	..	..	37	33	55	42	89	36	29	18	4
Colorado	2	..	3	4	28	..	..	..	..	..	..	1	5	8	8	1	..	..	24	18	21	75	235	19	3	..	1
Illinois	7	12	23	4	1	..	..	..	..	1	..	..	..	..	..	..	..	..	115	117	106	5	..	..	..	..	..
Indiana	11	18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	118	132	21	..	..	..	..	..	..
Iowa	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
Florida	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2	..	2	..	1
Kansas	..	5	36	60	21	..	..	..	..	..	..	2	9	33	..	..	..	..	2	91	357	357	92	..	..	..	..
Kentucky	26	16	2	..	..	..	..	..	..	1	3	..	..	..	..	..	..	..	211	111	15	..	2	1	1	..	..
Louisiana	..	1	4	1	11	9	7	2	3	..	..	1	1	2	8	6	..	..	2	14	51	23	81	83	91	72	24
North	..	1	4	1	11	5	3	..	..	..	..	1	1	2	8	5	..	..	2	13	50	23	81	28	5	..	..
South	..	..	..	..	..	4	4	1	3	..	..	..	..	..	..	1	..	..	..	1	1	..	..	52	82	69	22
Offshore	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	4	3	2
Michigan	..	..	1	7	..	..	..	..	..	..	..	4	4	..	..	..	..	..	5	39	56	61	3	..	..	..	..
Missouri	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
Mississippi	..	..	..	1	4	..	13	4	..	..	1	..	..	..	1	..	..	..	..	2	6	17	78	30	82	38	2
Montana	..	3	1	1	2	3	..	..	..	..	..	2	..	..	..	..	..	..	8	9	23	25	29	9	5	1	..
Nebraska	..	..	1	5	35	..	..	..	..	..	..	..	..	..	..	..	..	..	1	4	5	50	308	1	..	..	..
New Mexico	4	2	6	5	9	2	3	2	..	..	..	..	..	2	..	2	..	..	46	44	36	22	35	14	11	8	..
Nevada	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..
New York	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	2	8	7	1	1	2	..	..
North Dakota	..	..	6	1	7	4	1	1	..	..	..	..	..	..	..	..	..	..	..	3	19	8	16	12	6	..	..
Ohio	..	2	4	1	..	..	..	..	..	..	1	4	2	1	..	..	..	..	1	5	8	9	1	..	..	..	..
Oklahoma	2	3	6	13	43	26	6	1	..	..	6	2	7	39	11	6	1	1	124	96	94	78	147	71	15	8	4
Pennsylvania	..	..	..	..	..	..	..	..	..	..	..	..	..	3	1	..	..	..	..	..	3	..	14	..	..	..	..
South Dakota	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	2	..	..	..	6	..	..	..
Tennessee	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	31	7	..	..	..	..	..	..	..
North Carolina	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9	..	..	..	..	..	..	..
Oregon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..
Texas	6	23	40	54	62	31	18	4	..	2	9	11	13	18	3	3	..	..	248	603	511	584	682	379	116	32	9
District 1	1	1	..	..	2	1	1	..	..	..	1	1	..	..	..	..	..	..	93	83	66	25	42	6	4	1	1
District 2	..	..	..	1	7	5	..	..	..	..	..	2	5	7	..	..	..	..	4	7	13	31	65	60	14	2	..
District 3	..	..	..	..	1	3	3	..	..	..	..	..	1	1	1	..	..	..	3	1	5	5	30	116	32	9	..
District 4	..	..	2	3	9	5	2	..	..	..	1	3	..	1	2	3	..	..	37	24	48	57	71	55	17	3	1
East	1	..	1	1	4	..	1	..	..	..	..	..	..	..	..	..	..	..	16	26	13	48	96	34	9	..	..
District 7-B	2	15	22	19	8	..	..	..	..	1	5	3	5	3	..	..	..	..	39	200	155	116	96	..	..	..	..
West	2	3	6	7	6	13	9	4	..	1	2	1	1	3	..	..	..	..	34	89	114	163	148	75	36	17	7
District 9	..	4	6	23	24	1	..	..	..	..	..	..	1	3	..	..	..	..	21	172	85	118	108	7	..	..	..
District 10	..	..	3	..	1	3	2	..	..	..	..	1	..	..	..	..	..	..	1	1	12	21	26	26	4	..	..
Utah	..	..	..	..	5	1	..	1	..	1	..	2	..	3	..	1	..	..	8	4	11	4	49	8	2	1	..
Washington	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	1	..	..
West Virginia	..	..	..	..	..	..	..	..	..	..	6	1	10	6	..	..	..	..	..	1	..	..	3	2	..	..	..
Wyoming	3	1	2	2	10	2	1	..	..	..	..	1	3	6	7	3	1	..	25	34	37	24	139	59	10	4	..
Total United States 1959	**63**	**90**	**146**	**163**	**242**	**91**	**56**	**19**	**3**	**6**	**28**	**38**	**59**	**140**	**42**	**23**	**2**	**2**	**1,020**	**1,404**	**1,512**	**1,416**	**2,035**	**748**	**382**	**185**	**45**

NOTE: A = 0-1,250 ft.; B = 1,250-2,500 ft.; C = 2,500-3,750 ft.; D = 3,750-5,000 ft.; E = 5,000-7,500 ft.; F = 7,500-10,000 ft.; G = 10,000-12,500 ft.; H = 12,500-15,000 ft.; I = 15,000 ft.

Unexcelled in all around Digging Performance

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COMPLETE WELLS IN LESS TIME WITH FEWER BITS

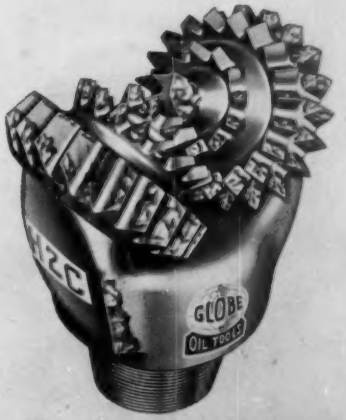
The "2-Cutter" is an important GLOBE first for the oil industry. The GLOBE "2-Cutter" was the first successful 2-Cutter type rock bit and the first with the jet as an integral part of the bit body.

S2 unexcelled for the fast digging in broken formations where "balling up" does not present a problem.

SS2 with deep, widely spaced teeth takes a vicious bit of formation. An outstanding performer in fast digging and crooked hole country.

M2 exceptionally efficient for unconsolidated formations, particularly medium shales interspersed with layers of hard strata.

MH2 extremely economical for chipping action in hard formation and for work from top to bottom.



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ALL GLOBE 2-Cutter "Task-Type" Rock Bits are available in both regular and jet types.

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Cameron Type "F" Gate Valves for API service have reduced operating cycle costs to the lowest of any valve in similar service.

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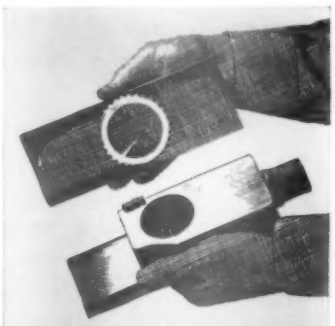
The rotating seat design found only in Cameron Type "F" Gate Valves exposes a new sealing pattern each time the valve is operated. Old design concepts are based on wedge fits to increase gate or plug contact pressure, viscous lubricants to bridge abrasions and reduce inherent friction, soft seals, or combinations of these conventional solutions to a tough problem. After extended tests and evaluation of every contemporary valve for API service, a summary revealed that all valves had one common characteristic. The down stream seat showed the most wear—maximum erosion always occurred in the same point—where pressure was first released in opening or where pressure was finally pinched off in closing.



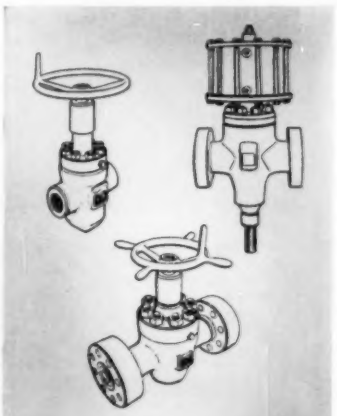
Easy in-line replacement of this simplified gate package reduces cost when repairs are finally necessary.

Then a new idea was conceived. Rotating the seat a fraction of a turn each time the valve was opened and closed would present a new surface at the critical point of greatest wear. This principle is the central feature of the Cameron Type "F" Gate Valve.

Downstream sealing surface in ordinary valves, notice small area which receives most erosion.

Downstream sealing surface in Cameron Gate Valve, the wear pattern changes with each operation.

WHAT ABOUT COST?
All marketable valves when purchased must hold and release pressure. But purchase price does not represent total cost to use a valve. To purchase price must be added operating cost (continuous lubrication, frequent and difficult repair, slow operation) for the useable life of the valve. Divide this total by the number of times the valve is operated and you have a true picture of the original purchase. Actually you are buying operating cycles. If you want the most operating cycles without maintenance—the lowest cost per cycle during the entire life of the valve no matter how tough the service, try Cameron Type "F" Gate Valves.



Cameron Gate Valves are available in sizes from 2 to 6 inches, and pressures to 15,000 psi, including manually or pressure operated models (hydraulic or pneumatic) for remote controls and automated circuits.

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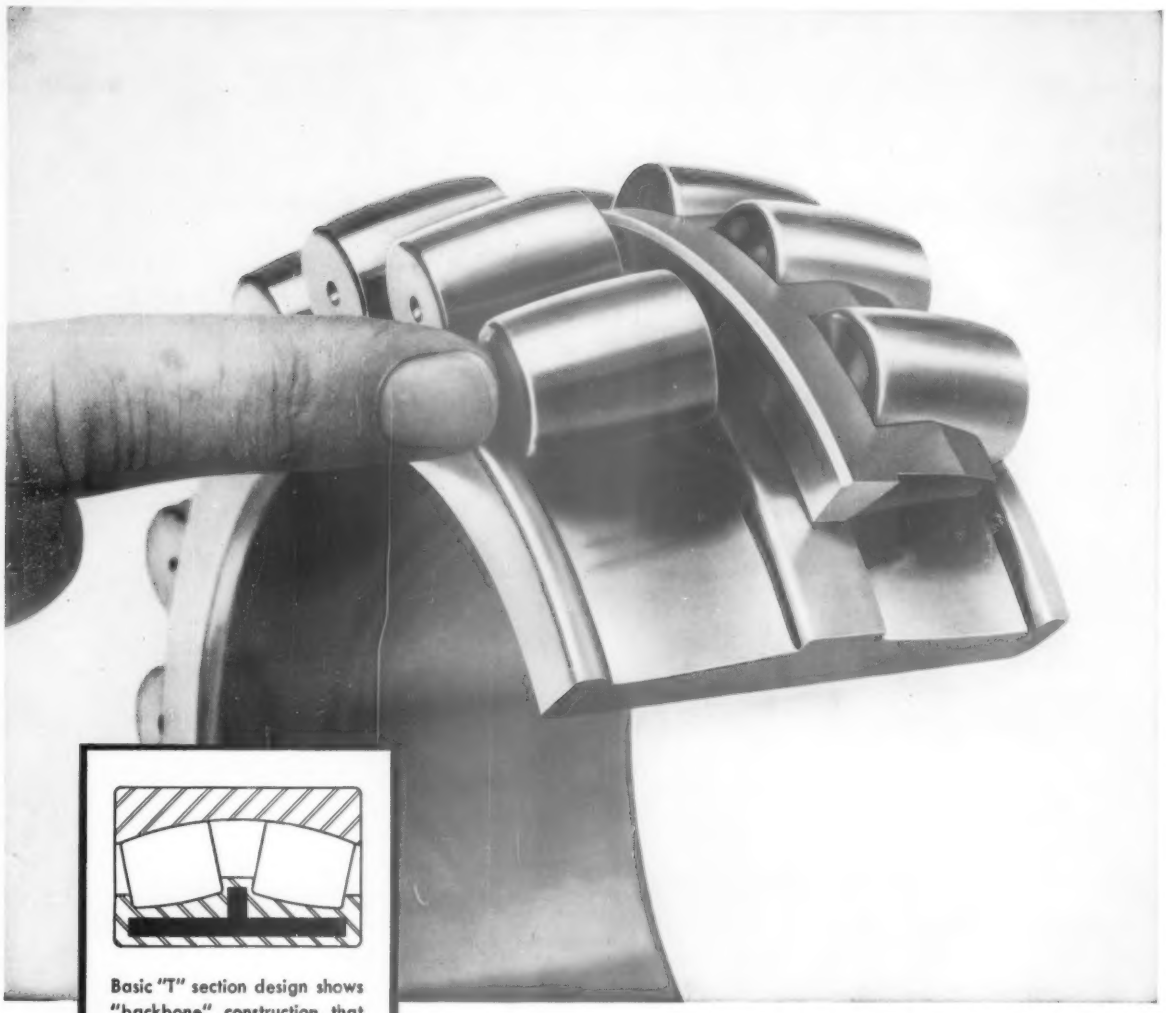
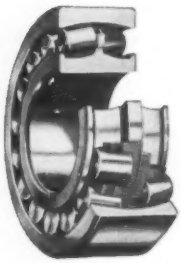


Basic "T" section design shows "backbone" construction that insures positive roller guidance and stability without skewing under all load conditions.



For roller stability...

there's nothing like "the bearing with the backbone"

The only *positive* way to guide rollers is by an integral center guide flange—backbone of the *Torrington* Spherical Roller Bearing. No floating ring can match it for stability under heavy radial and thrust loads.

This "bearing with the backbone" insures true rolling motion . . . prevents stress concentration . . . means minimum friction. It makes possible open-end cage design, too, with no shrouds to impede circulation of lubricant to bearing contact surfaces. There is less heating and more positive lubrication.

The integral center guide flange is adapted from the same principle used in the design of Torrington Tapered Roller Bearings. This refinement is typical of Torrington's uncompromising engineering that assures you the ultimate in bearing performance.

progress through precision **TORRINGTON BEARINGS**

THE TORRINGTON COMPANY South Bend 21, Indiana • Torrington, Conn.

Field wells—1959 depth classification breakdown

	OIL									GAS									DRY								
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Alabama	..	..	..	..	1	..	69	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..
Arizona	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..
Arkansas	4	174	214	29	15	11	..	..	..	..	4	8	4	15	1	..	..	..	1	26	122	33	22	8	..	..	..
California	190	179	128	80	101	70	78	26	..	..	4	11	13	16	1	1	..	..	10	30	22	24	46	18	14	5	..
Colorado	..	6	9	28	68	12	..	..	..	..	1	7	8	34	10	..	..	..	2	4	14	33	109	2	..	..	..
Illinois	66	418	475	2	1	..	..	..	..	8	..	..	..	..	..	..	..	..	143	210	360	6	..	..	..	..	..
Indiana	89	150	27	..	..	..	..	..	..	11	..	..	..	..	..	..	..	..	102	178	14	..	1	..	..	..	..
Kansas	..	388	698	492	60	..	..	..	..	..	11	38	46	35	..	..	..	..	3	114	522	352	46	1	..	..	..
Kentucky	1,906	171	25	..	..	..	..	..	..	30	56	131	63	5	..	..	..	..	306	196	42	8	..	..	..	..	..
Alaska	..	..	..	..	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..
Louisiana	110	440	153	60	156	323	300	160	46	19	54	15	8	18	40	15	5	4	27	101	169	66	114	159	190	117	41
North	92	400	118	34	68	11	4	..	..	19	53	15	6	14	33	4	..	..	18	75	145	48	82	27	4	..	..
South	18	40	35	26	69	226	205	143	44	..	1	..	2	4	5	5	4	4	9	21	19	16	26	104	153	98	33
Offshore	..	..	..	..	19	86	91	17	2	..	..	..	..	..	2	6	1	..	..	5	5	2	6	28	33	19	8
Maryland	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Michigan	1	63	94	71	4	..	..	..	..	5	10	24	7	..	..	..	..	..	8	35	53	41	7	..	..	..	..
Mississippi	..	..	..	15	37	23	121	29	4	..	..	..	..	..	..	..	..	..	..	..	..	13	34	17	36	7	..
Montana	1	31	48	10	31	36	..	..	..	..	1	7	..	1	..	..	..	..	3	12	22	4	16	3	..	..	..
Nebraska	..	..	1	25	226	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	2	18	226	..	..	..	..
New Mexico	88	264	292	262	220	34	43	3	..	5	69	37	122	100	22	..	..	..	25	40	46	41	18	9	12	7	..
New York	..	144	..	..	..	..	..	..	..	..	2	5	..	..	..	..	..	..	..	6	..	..	..	..	..	..	..
North Dakota	..	..	39	40	73	82	19	..	..	..	..	..	..	..	..	..	..	..	..	..	32	12	30	13	7	..	..
Ohio	84	38	348	7	..	..	..	..	..	63	52	141	32	1	..	..	..	..	87	51	91	20	1	..	..	..	..
Oklahoma	369	689	731	301	273	196	21	..	..	3	20	43	32	176	42	2	..	1	281	370	339	193	186	56	7	2	1
Pennsylvania	..	160	..	..	..	..	..	..	..	..	44	141	54	84	..	..	..	..	..	22	12	5	10	1	..	..	..
South Dakota	..	..	..	..	..	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Tennessee	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	13	2	..	..	..	..	..	..	..
Texas	1,167	1,889	2,816	1,554	1,565	763	166	45	..	14	133	201	98	186	56	23	7	2	406	830	638	504	514	304	77	15	1
District 1	150	231	93	30	5	1	2	..	..	3	2	16	3	2	..	7	..	..	55	54	48	9	13	7	2	..	..
District 2	5	..	26	39	90	20	3	..	..	..	9	19	19	31	15	1	..	..	3	5	38	34	56	41	1	2	..
District 3	50	59	57	54	106	128	20	4	1	..	..	3	3	8	6	2	..	..	43	38	32	31	46	100	32	3	1
District 4	25	66	81	34	128	40	4	..	..	2	16	37	31	35	22	8	..	..	26	33	59	32	107	41	11	..	..
East	232	47	126	109	116	76	..	1	..	..	3	..	1	7	..	..	..	..	17	25	21	31	71	20	2	..	..
District 7-B	170	452	154	323	75	..	..	..	..	1	14	8	17	2	..	..	..	..	120	234	119	133	50	..	..	..	..
West	46	320	1,463	758	817	408	133	40	..	5	5	23	6	6	1	5	7	2	17	78	127	111	101	63	27	9	..
District 9	489	677	267	190	163	9	..	..	..	3	7	2	10	87	..	..	..	..	126	342	142	116	51	2	..	1	..
District 10	..	37	549	17	65	81	4	..	..	..	77	93	8	8	12	..	..	..	1	21	52	7	17	30	2	..	..
Utah	2	..	1	..	173	..	..	..	..	4	..	..	1	4	..	..	..	..	4	2	..	1	25	..	..	..	..
West Virginia	4	78	11	..	..	..	..	..	..	5	371	131	14	6	..	..	..	..	10	70	24	11	3	..	..	..	..
Wyoming	41	17	68	62	148	6	8	..	..	2	3	9	4	18	15	2	..	..	42	19	12	26	48	18	4	..	..
Missouri	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Virginia	..	..	..	..	..	..	..	..	..	..	..	3	7	..	..	..	..	..	..	..	..	1	..	..	..	..	..
Total United States 1959	**4,125**	**5,300**	**6,178**	**3,038**	**3,153**	**1,572**	**826**	**263**	**51**	**169**	**835**	**952**	**514**	**702**	**187**	**43**	**12**	**7**	**1,474**	**2,318**	**2,536**	**1,412**	**1,457**	**610**	**350**	**154**	**43**

NOTE: A = 0-1,250 ft.; B = 1,250-2,500 ft.; C = 2,500-3,750 ft.; D = 3,750-5,000 ft.; E = 5,000-7,500 ft.; F = 7,500-10,000 ft.; G = 10,000-12,500 ft.; H = 12,500-15,000 ft.; I = 15,000 ft

Mobil's Leonard C. Stevens . . . vice president at Los Angeles.

Globetrotting Ends in LA

. . . for Mobil's new division vice president. Stevens has worked around the world during his 30-year oil career.

SOME 30 years ago, Leonard C. Stevens graduated from Birmingham University in England, took a job with an international oil company, took out American immigration papers, and made reservations on a U. S. bound ship. This year, 30 years later, he made it here on a permanent assignment.

What happened in the meantime would make Lowell Thomas look like an old stay-at-home.

It is interesting to note that in the intervening 30 years he failed to visit either the North or the South Pole. But that's about all he missed.

But, we're getting ahead of the story.

Suffice it to say he brings a world of experience (in every sense of the word) to his new post as vice president of Mobil Oil Co.'s Los Angeles exploration and producing division.

He planned a civil-engineering career when he entered Birmingham U. Shortly after starting school, he came under the tutelage of the noted Alfred W. Nash. Professor Nash convinced him his best interests would be served by following the oil game. This was the same Prof. Nash who was one of the principal editors and authors of the internationally famous "Science of Petroleum," which was a standard reference work for many years.

After he graduated with honors in 1930 as a petroleum engineer, Stevens was set to come to the U. S. with Shell Oil Co. He also received the Sir John Cadman medal and Institute of Petroleum Scholarship and Prize that year.

But, as so many domestic petroleum engineering graduates of that time quickly learned, the depression had knocked the props out of the U. S. oil business. So, Stevens cancelled his passage and went to Romania instead as a "praktikante." In the vernacular of Las Vegas, that's saying he was a "trainee-roustabout"—the hard way.

Shell called him back to The Hague in 1931 where he worked on petroleum geology and reservoir engineering problems as a junior engineer. The head of this department directing Shell's world-wide production activities at the time was B. H. Van der Linden, who is well known on the Pacific Coast for his role in developing commercial production in California's big Ventura Avenue field and the Coalinga area.

Closing in . . . In October, 1932, Stevens crossed to this side of the Atlantic—but he didn't make it to the U. S.

He was assigned to Trinidad, where he spent 2½ years as production foreman and a year as petroleum engineer for United British Oil Co. of Trinidad, a Shell subsidiary. In 1936, he jumped across the Gulf of Paria into Venezuela as an exploitation (development) engineer for Shell. His activities for the most part involved subsurface geology and reservoir engineering.

Stevens finally got a glimpse of the U. S. in 1940 and again in 1943 when Shell sent him on a familiarization tour of California and Mid-Continent.

Ecuador was his next port of call. In 1944 he pioneered the industry's first all-airborne drilling operation when a Shell rig was flown into an Oriente jungle site with a DC-3.

He returned to England later in 1944 when Shell called him back to help rebuild the company's war-scattered technical staff in London. With buzz bombs and V-2's coming over the English channel, for once in his career, he was more concerned with blowups than blowouts.

At the end of the war, he went back to Holland to help re-establish Shell's headquarters in The Hague.

Stevens resumed his globetrotting in 1949 when Shell sent him to the Middle East. This jaunt saw him touch down in Egypt, Lebanon, Iraq, Iran, Kuwait, Behrain, Qater, and West Pakistan.

In 1950, Stevens returned to Venezuela as chief engineer of Shell's Venezuelan operations.

Joins Mobil . . . About this time, a plan he'd had in the back of his mind for some years neared realization. He still wanted to settle in North America, more particularly, in Canada.

In July, 1951, he decided to make the big move. He resigned from Shell, and largely on speculation, headed for Canada. He caught on almost immediately with what is now Mobil Oil Co. of Canada as chief engineer. Shortly thereafter, he was named manager of production and in 1953, Stevens was made a vice president and director of the company.

Under his direction, Mobil of Canada made many notable discoveries, including the famed Pembina field. Also under his guidance, water flooding and miscible phase displacement flooding were conducted quite early at Pembina and the world's largest fully automated production operation installed. He served for several years as chairman of the Pembina Operators Committee.

It was in 1958 that he wrapped up the rest of the world in his travel

portfolio when he was sent to Indonesia on a reorganization study of Standard Vacuum Oil Co.'s operations. This little round-the-world journey took him to Japan, Hong Kong, Siam, Singapore, Sumatra, India, and Turkey.

Finally made it . . . When General Petroleum Corp. was merged into Mobil Oil this year, Stevens was assigned to head up the new division in Los Angeles.

So, after a 30-year wait, Stevens has finally made it to the U. S. on a permanent assignment.

In answer to a query on exploration trends in his division, he says: "There will be increased emphasis on exploration in Alaska. Although, due to the current world-wide excess of potential production, development may not be as rapid as would have been the case a few years ago.

He and his Dutch-born wife have moved into a Los Angeles suburban home overlooking the Pacific Ocean. This particular suburb, Palos Verdes, is conveniently located within minutes of the International Airport and major steamship terminals—which, based on past experience, was a pretty astute move on Stevens' part.

Although he and his wife have settled down here, the Stevens clan is still scattered around. They have a son attending the University of Alberta in Canada and a married daughter living in Italy, which means he may add Italian to his language repertoire, which includes Dutch, Spanish, German, and French.

●

Ford M. Graham, formerly vice president of Monterey Oil Co., has been elected a vice president of Louisiana Land & Exploration Co. He will headquarter in New Orleans.

Edward C. Lawson, Jr., has joined Lawson Petroleum Co., Tulsa, as vice president. Lawson formerly was with Pan American Petroleum Corp., Western Acidizing Co., and Manhart, Millison, & Beebe.

Dr. Richard O. Norris, research associate for Cities Service Research & Development Co., has been promoted to head of the materials division at the Lake Charles, La., laboratory. **J. T. Kelly,** formerly with American Oil Co., has been named head of process research for Cities Service in Lake Charles. **John J. Hagan** has joined the Lake Charles staff as senior research engineer, and **H. M. Knight** has joined the lab as senior research chemist.

John Knudsen, Jr., consultant, has been elected a director and appointed general manager of Kent Petroleum Corp.

Richard M. Davis, manager of the Rocky Mountain division office of Mid-America Minerals, Inc., in Denver, has been named exploration manager of the company.

Leonard W. Heiny, staff geologist in Houston for Continental Oil Co., has been promoted to assistant regional geologist, Rocky Mountain region. He will headquarter in Denver.

John C. Jarratt, chief process engineer in the El Paso, Tex., refinery of Texaco Inc., has been appointed supervisor of operations at Texaco's Eagle Point refinery, Westville, N. J.

Ben A. Lovell, district engineer for Sunray Mid-Continent Oil Co.'s western Oklahoma district in Oklahoma City, has been appointed gas coordinator for the central division. He succeeds **H. H. Everett,** who recently resigned to join Sadler Brothers Pipe Line Construction Co.

Organization of Sohio Petroleum Co.'s new exploration department and production department has been completed. **Gordon H. White** has been named manager of exploration for the United States and Canada. He will headquarter in Oklahoma City. **John T. Cooke** will continue as foreign operations manager, and **L. F. Elkins** as research manager. **J. Walter Johnson** is senior exploitation geologist; **Dr. A. C. Munyan** is senior exploration geologist; and **Paul M. Miller** is chief staff assistant, finance and budget. Exploration managers include **Dwight H. Seely,** Gulf Coast; **Brame Womack,** Mid-Continent and Rocky Mountains; and **William C. MacQuown,** Canada. Staff assistants in the exploration department are **H. R. Adams, C. C. Sellers,** and **H. D. Fox. Charles H. Burke** will be land manager. Also on the exploration staff are **G. T. Schmitt,** staff geologist; and **H. M. Norman,** administrative staff assistant. In production, **C. C. Irby** has been named assistant general manager. **Joseph H. Field,** general superintendent, north area, and **Burton W. Whiteley,** general superintendent, south area, will supervise field operations. **E. E. Young** will continue as chief engineer. **A. E. Hall** is assistant chief engineer. **Vernon E. Holmes, Roy C. Gould,** and **James E. Owens** are staff assistants in production. **Howard B. Shelton** is gas-gasoline division manager. **Charles W. Karcher** is economic research analyst. **Franklin A. Black** is employe and public relations manager for both departments. Department heads **R. W. Edmund,** general manager for exploration, and **Frank H. Willibrand,** general manager for production, were appointed several months ago.

Ray Blakely, geologist in Denver for Tennessee Gas & Oil Co., has been promoted to district geologist there. He succeeds **C. S. Algire,** who has been transferred to Casper, Wyo., as district geologist.

C. E. Greenwood, Gulf of Mexico division geologist for Continental Oil Co., has been promoted to administrative assistant to the president of Conoco. He will continue to headquarter in Houston.

Gaines R. Whittington, Luling, Tex., has been elected president of the new Central Texas Oil and Gas Association. Other officers will be **Gus T. Brown, Jr.,** Luling, secretary-treasurer; **E. F. Edwards,** Lockhart, Tex., first vice president; and **Roy Vick,** Luling, second vice president. Directors include Whittington, Brown, **Larry Staub,** Lockhart; and **William Schomerus,** Luling.

William B. Hudson, Jr., has been elected vice president in charge of refinery engineering for Arthur G. McKee & Co. He will be responsible for estimating and for process and mechanical design of petroleum refineries, chemical, and petrochemical plants. Hudson succeeds **F. Drake Parker,** who is now managing director of McKee Head Wrightson, Ltd., in London.

A. C. Mattei has resigned as chairman of Honolulu Oil Corp., but will continue as a director of the company. The office of chairman will not be filled at present, but Honolulu has named two new executive vice presidents and a vice president. **Alden S. Donnelly,** vice president, director, and manager of the Mid-Continent division, has been named executive vice president, exploration, development, and production. **Warren H. Kraft,** director and vice president in charge of the natural-gas and gasoline department, has been elected executive vice president, manufacturing and administration. **R. L. Blunden,** general manager of the northern Rocky Mountain division, has been elected vice president, northern Rocky Mountain division. Mattei had been chairman of the company since 1958 and was president before that time.

Personals

Harris Bateman, manager of engineering and purchasing for Cities Service Oil Co. and coordinator between Bartlesville, Okla., headquarters and the company's marketing division in Chicago, has been elected a vice president. **Lloyd A. Lynd,** vice president, treasurer and a director of the company, has been elected financial vice president and chief financial officer. **G. R. Preston,** assistant treasurer, has been named treasurer and a director. Bateman was coordinator of purchasing for all Cities Service companies at one time. He also had been chief engineer for Cities Service in Bartlesville before being named manager of engineering and purchasing. Lynd has been with the company since 1919. He had been treasurer and a director since 1941 and a vice president since 1949.

BATEMAN

R. Y. Pogontcheff, mechanical engineer for Shell Oil Co. in Bakersfield, Calif., has been transferred to Los Angeles as production engineer.

Robert W. Peterson, petroleum engineer with Union Oil Co. in Denver, has joined Intex Oil Co. as drilling and production engineer, Denver.

Charles B. Anderson, area sales supervisor in San Pedro, Calif., for Tidewater Oil Co., has been named commercial sales supervisor in the western division, a new position. He will headquarter in Los Angeles.

Art M. Hill, superintendent of line maintenance, and **Fred W. Zilm,** contracting administrator, Service Pipe Line Co., received the A. F. Davis Silver Medal for 1959 at American Welding Society's annual meeting this week in Los Angeles. The annual Davis awards recognize contributions to welding in the fields of machine design, structural design, and maintenance. Hill and Zilm were recognized in the maintenance category.

H. N. (Nat) Aicklen, senior engineer in the Texas Railroad Commission's gas department, Austin, has joined Transwestern Pipeline Co. Aicklen had been with the commission in Midland and Austin since 1952.

A. R. Field, terminal foreman with Continental Pipe Line Co. in Belle, Mo., has been promoted to senior staff engineer in Ponca City, Okla.

Joseph B. Jackson, assistant pipeline maintenance foreman for Service Pipe Line Co. in Humboldt, Kans., has been appointed pipeline maintenance foreman in Tomball, Tex. He succeeds **Gil Rice,** who is on special assignment with Pan American International Oil Co. **W. W. Tarrant** will succeed Jackson in Humboldt.

John W. Patterson, engineer with Mobil Oil Co. in Wichita, has been transferred to Dallas as senior engineer for Magnolia Pipe Line Co.

James E. Latta, process research director for Pan American Petroleum Corp. of Tulsa, has been transferred to Whiting, Ind., as research associate for Standard Oil Co. (Ind.), the parent company.

Paul M. Crandall has been named vice president of La Gloria Oil & Gas Co. and will be assistant to the senior vice president in charge of the company. La Gloria is Texas Eastern Transmission Corp.'s oil division.

William R. Yinger has resigned as vice president and exploration manager of King-Stevenson Oil Co. to open offices as independent operator in Oklahoma City.

Eugene E. Dawson, general manager of American Independent Oil Co.'s Neutral Zone operations, has been elected vice president and general manager of the company. **J. O. Cumberland,** secretary - treasurer, has been named vice president and treasurer. **Robert A. Bussian,** company attorney, has been named secretary.

Brian Barrow, chief geologist in Ecuador for Tennessee del Ecuador, S.A., a subsidiary of Tennessee Gas Transmission Co., has been transferred to Lagos, Nigeria, as exploration manager of Tennessee Nigeria, Inc. **Eldon House,** senior geologist for Chaco Petroleum S.A., in Bolivia, will succeed Barrow in Ecuador. **Lynn Robertson,** senior geologist with Tennessee del Ecuador, has been promoted to district geologist for Tennessee Argentina, S.A. He will headquarter in Rio Grande, Tierra del Fuego. **T. I. Wallis,** geologist with Chaco Petroleum in Bolivia, also has been transferred to Tierra del Fuego. The companies, all TGT subsidiaries, are operated by Tennessee Overseas Co., overseas division of the parent company.

George H. Davis, formerly district geologist for Colombian Sun Oil Co. in Bogota, Colombia, has been transferred to Sun Oil Co.'s Pittsburgh district office.

Walter A. Anderson, resident manager of Procon (Canada), has been elected a vice president of the company.

Jack M. Paul has been named a group leader in the Whiting, Ind., research laboratories of Standard Oil Co. (Ind.). Paul has been with Indiana Standard since 1950.

R. C. Brown, senior engineer in Houston for Sohio Petroleum Co., has been promoted to staff engineer and transferred to Oklahoma City.

John A. Murphy has been appointed executive vice president of Texam Oil Corp. He will supervise all exploration activity and other technical operations and will evaluate new drilling prospects. Murphy formerly was vice president, general manager, and a director of Constock International Methane Co.

W. W. Kessler, district geologist in Shawnee, Okla., for Humble Oil & Refining Co.'s Carter Division, has been transferred to Carter's Tulsa headquarters as staff geologist, central area. **J. L. Fortin,** Tulsa, will succeed Kessler in Shawnee. Also, **D. H. Roberts** has been transferred to Liberal, Kans., from the Tulsa geological staff.

Deaths

Alexander E. Walker, Sr., 72, chairman of National Supply Co., and a former president of the firm, died April 19 in Pittsburgh. Walker also was a director of Armco Steel Co., Blaw-Knox Co., and others.

Thomas J. Hickey, 77, founder of Hickey Pipe & Supply Co. in Coalinga, Calif., in 1917, died April 16 in a Bakersfield, Calif., hospital after a long illness.

Roland Robinson Fishell, 81, pioneer California oil man, died April 14 at his home near Bakersfield, Calif., after a long illness. Fishell was active in Signal Hill and Kern County oil development and was a founder of HH&F Oil Co.

▶▶▶ Personals

Harris Van Zandt, general manager of exploration and production for Pure Oil Co., has been elected vice president for exploration and production. He succeeds **Raymond B. Kelly,** who will continue as vice president and a director. Van Zandt joined Pure in 1953. He was manager of the Rocky Mountain producing division in Denver before assignment last year as general manager, exploration and production.

VAN ZANDT

Clarence A. Christ, design engineer (coordinator) at American Oil Co.'s Texas City refinery, has been promoted to senior design engineer (coordinator) in the plant engineering department.

Clifton C. Garvin, Jr., assistant general manager of the supply department for Humble Oil & Refining Co.'s Esso Standard Division, has been promoted to general manager, supply department. He succeeds **Donald M. Cox,** who recently was named manager of supply and distribution for Humble in Houston.

W. T. Blackburn, partner in Vaughey & Vaughey, Jackson, Miss., producing company, has been elected president of the Denver Petroleum Club. Other new officers are **Collis P. Chandler, Jr.,** Chandler & Simpson, and **W. W. Walmsley,** Sun Oil Co., vice presidents; and **Bill Goodin,** Petroleum Information, secretary-treasurer.

John E. Swearingen, president of Standard Oil Co. (Ind.), has been elected a trustee of Carnegie Institute of Technology.

Harry McDonald has been named district manager and engineer in Texas National Petroleum Co.'s new Denver district office. **Frank Peace** will be Denver district geologist with **Jack W. Capps** as district land man.

Philip E. Darling, director of professional recruiting for American Oil Co., Texas City, has been transferred to the Whiting, Ind., refinery of Standard Oil Co. (Ind.), as head engineer, coordinating.

Kenneth D. Robertson, executive assistant to Tidewater Oil Co.'s division marketing manager in Los Angeles, has been appointed assistant division marketing manager, western division.

James J. Statler has been named Canadian area manager for United Producing Co., Inc. He will headquarter in the company's new Calgary office. Statler has been a vice president of Pacific Petroleum, Ltd.

Harry E. Haynes, manager of Rocky Mountain operations for William J. Carey, Dallas independent, has been appointed Dallas division geologist for Carey. **Dolf W. Fieldman** will continue as district geologist in Denver.

B. G. Newton, district geologist for Pan American Petroleum Corp. in Bismarck, N. D., has been transferred to Pan Am's Casper, Wyo., division office. **David Ewing,** district geologist in Casper, will succeed Newton.

W. H. Woods has been elected a vice president of Texas Gas Exploration Corp., a subsidiary of Texas Gas Transmission Corp.

Marvin C. Boyd, production engineer with Cities Service Oil Co., has been transferred to Columbus, Tex., from Odessa, Tex.

Matthew B. Gordy, assistant division drilling superintendent for Pan American Petroleum Corp. in Houston, has moved up to division drilling superintendent, Texas-Louisiana Gulf Coast division. He succeeds **George McCrary,** who has retired.

Dr. Tell Ertl has been appointed chief mining engineer for Cameron & Jones, Inc., Denver consulting firm. He will be given an assignment as adviser to the Brazilian Government on oil-shale mining. Ertl headed the Rifle, Colo., U. S. Bureau of Mines research team working with oil shale from 1944 to 1948. More recently he has been consultant to Union Oil Co. on oil shale.

W. H. Tuttle, assistant division manager in Denver for Skelly Oil Co., has been promoted to Denver division manager. He succeeds **Lloyd F. Hartwig,** who recently was transferred to Kansas City. **George H. Partridge,** Berthoud, Colo., will succeed Tuttle.

Ollie L. Turner, 49, manager of the export division of Bowen Itco, Inc., Houston, died April 11 after suffering a heart attack while on a business trip to Mexico.

William Landon Boyd, 68, retired foreman at DX Sunray Oil Co.'s Tulsa refinery, died April 16 at his home in Tulsa.

Raymond H. Lewis, 52, general sales manager for Buflovak Equipment Division of Blaw-Knox Co., died April 12. Lewis had been with the company for 25 years.

Alvin M. Iverson, 59, executive vice president of Iverson Supply Co., died April 18 at his home in Tulsa after a heart attack. He had been with the supply company since it was organized in 1926 and had been executive vice president since 1944.

Percy H. Batten, 83, founder and chairman of Twin Disc Clutch Co., died April 8 in Racine, Wis. Batten helped found Twin Disc in 1918. He became president in 1922 and chairman in 1948.

William Dow McIntyre, 73, retired superintendent of Danziga Oil Co., died April 15 in a Houston hospital. McIntyre retired in 1955.

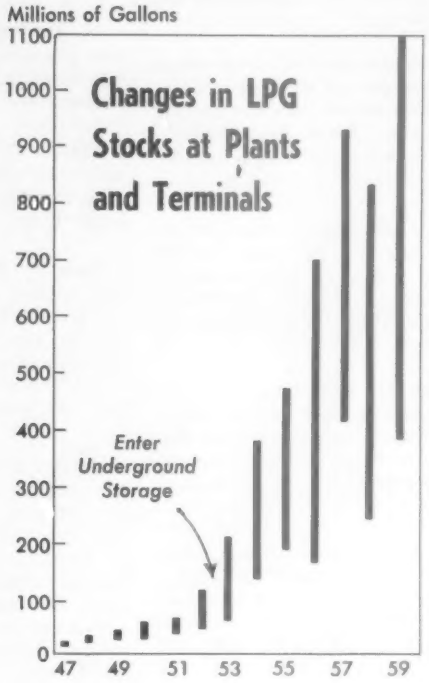
James Lewis Catt, 48, seismologist for Geo Prospectors, Inc., died April 17 in Tulsa after a heart attack.

Fred K. Houston, 77, vice president of Ralph M. Parsons Co. since 1948, died April 14 in a Los Angeles hospital after suffering a heart attack in his office. Houston had been with Parsons since 1935.

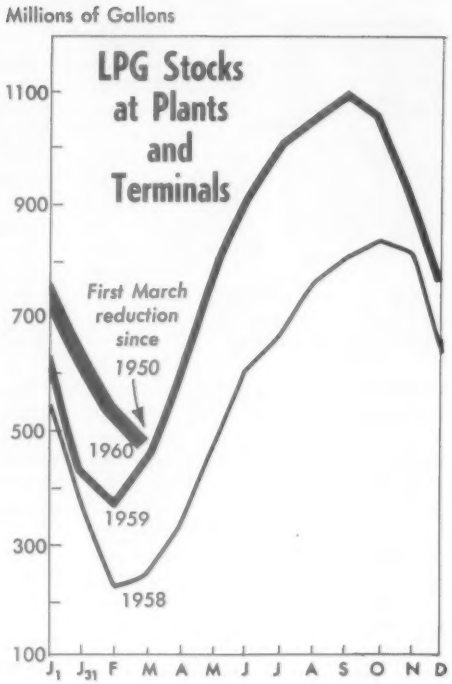
Herman W. Shubring, 63, gas transmission marketing consultant for Clark Brothers Co., division of Dresser Industries, Inc., died April 16. Shubring was with Ford, Bacon & Davis, Inc., and Northern Natural Gas Co. before joining Clark Brothers in 1951.

James D. McKenney, 59, drilling superintendent for Monterey Oil Co., died April 8. McKenney had been with Monterey and predecessor companies since 1943.

BARS on left chart show increases in LPG inventories each year since 1947. Bottom of each bar shows low point for stocks at the end of winter. Top of each bar is at inventory peak for the year, usually September or October. Length of bar represents net additions to storage during spring and summer.



LINES on right chart picture LPG stocks for 1958, 1959, and first quarter of 1960. Stocks last year reached an all-time high in September and also set a new end-of-year record.



Cold March sets a new LPG record

BY JOHN C. CASPER

COLD WEATHER and high demand for LPG in March cleaned out about 150 million gallons of storage that operators can refill this summer.

Total LPG inventories decreased 55 million barrels in March for the first March reduction since 1950, and even the 1950 first quarter was abnormal. Past stock records show that a stock drop in March was very unusual. But, it was needed and welcome.

Take a look at the LPG inventory position in the last quarter of 1959 and the first quarter of 1960 to see the carryover problem that was developing.

LPG stocks reached an all-time high at the end of September last year. The total for plants, terminals, and underground had climbed to almost 1.1 billion gallons or 259 million gallons above the inventory peak in 1958 and 164 million gallons higher than the previous record set in 1957.

The combined stock reduction for January and February this year was only slightly larger than withdrawals for January alone last year. Cold weather in the last half of February used up some of the surplus, but at the end of the month the stock total was 41% higher than it was the year before.

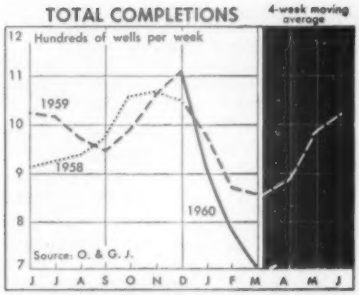
Stocks dropped about 55 million gallons in March in contrast with an inccrease of 85 million gallons for March a year ago. As a result, stocks at the end of the first quarter showed very little change from last year.

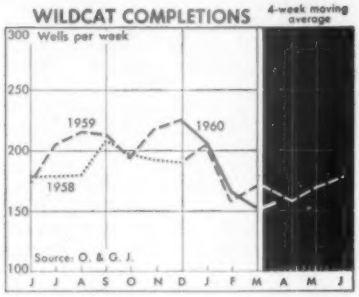
Some suppliers were short of material and had to buy propane in the last half of the month, but the stock level is low with plenty of room for surplus products that will come from plants during the summer months.

Operators and distributors continue to add underground storage capacity. By the end of the summer total capacity will top 2 billion gallons. With this extra working space, it is safe to predict that LPG stocks will set another record this fall. Greater dispersion of summer stock additions will make it possible to serve more LPG customers next winter. Demand will set a new record.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,140,485	DOWN	7,935	DOWN	209,880
Crude stocks	256,173,000	DOWN	2,054,000	UP	2,319,000
Completions	813	UP	124	DOWN	158
Refinery runs	7,898,000	DOWN	137,000	UP	42,000
Gasoline stocks	224,797,000	DOWN	198,000	UP	12,055,000
Kerosine stocks	18,853,000	UP	632,000	DOWN	993,000
Distillate stocks	76,378,000	UP	1,959,000	DOWN	5,140,000
Residual stocks	39,091,000	DOWN	282,000	DOWN	17,339,000
Four-product stocks	359,119,000	UP	2,111,000	DOWN	11,417,000
Total imports	1,895,700	UP	225,700	UP	781,100





Active Rotary Rigs

	4-18-60	4-11-60	4-20-59
Alabama	3	4	7
Alaska	5	5	(†)
Arkansas	10	12	14
Arizona	4	4	0
California	91	86	95
Land	86	82	93
Offshore	5	4	2
Colorado	23	21	32
Florida	2	2	2
Land	1	1	1
Offshore	1	1	1
Illinois	45	29	42
Indiana	4	3	10
Iowa	0	0	3
Kansas	129	120	141
Kentucky	8	3	8
Louisiana	303	303	333
North	41	36	34
S. Inland waters	105	128	147
S. Land	99	83	110
Offshore	58	56	42
Maryland	0	0	0
Michigan	20	26	16
Mississippi	73	60	60
Missouri	1	1	0
Montana	12	14	17
Nebraska	29	31	25
Nevada	0	0	0
New Mexico	115	106	115
New York	1	1	1
North Dakota	18	17	43
Ohio	4	4	0
Oklahoma	207	211	247
Oregon	0	0	0
Pennsylvania	11	11	11
South Dakota	1	1	2
Texas	620	629	760
S. Inland waters	10	10	7
S. Land	165	156	173
Offshore	1	1	1
North	44	47	141
Panhandle	52	55	(*)
East	63	60	(*)
West Central	185	196	276
West	100	104	162
Utah	30	32	33
Washington	0	0	0
West Virginia	5	4	4
Wyoming	55	60	60
Total U. S.	**1,829**	1,800	2,081
Western Canada	99	114	109
Eastern Canada	2	2	0
Grand total	1,930	1,916	2,190

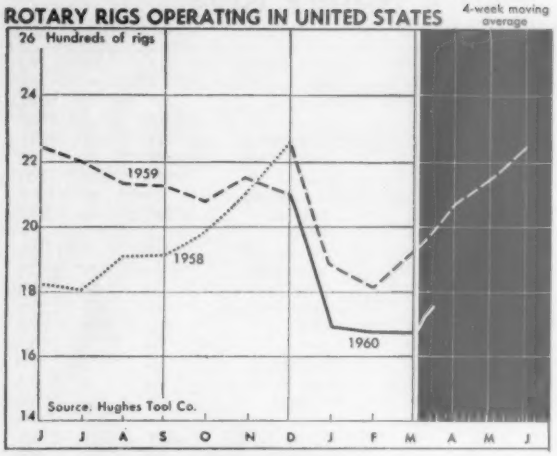
Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 16, 1960

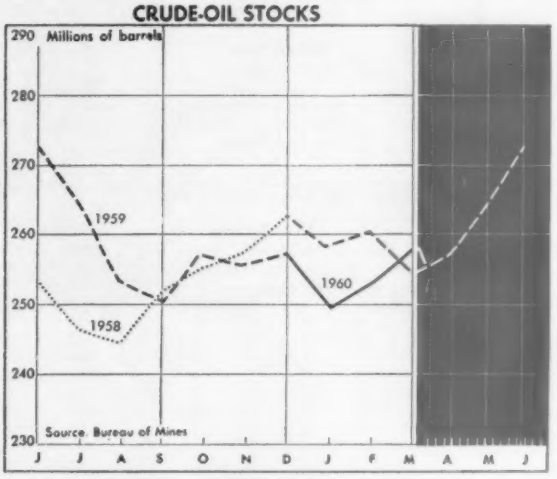
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	0	0	0	0	0	0	0	15	34	0	0	0	0	0	1	5
Arizona	0	0	0	0	0	0	0	6	.....	0	0	0	0	0	6	.....
Arkansas	8	6	0	1	1	0	35,427	163	262	0	0	0	0	0	41	47
California	23	14	0	1	8	0	137,193	377	444	6	0	0	0	6	82	111
Colorado	14	5	0	0	9	0	72,145	206	211	7	1	0	0	6	95	124
Illinois	13	4	0	0	9	0	28,828	579	602	2	0	0	0	2	151	99
Indiana	24	5	0	0	18	1	32,971	249	187	10	0	0	0	10	106	63
Kansas	42	11	0	1	29	1	158,989	901	1,179	16	1	0	0	15	303	265
Kentucky	29	8	0	5	16	0	45,546	522	471	4	0	0	0	4	63	50
Louisiana	55	23	4	5	23	0	520,074	944	1,025	10	1	0	1	8	143	133
North	14	7	0	4	3	0	55,130	295	362	4	1	0	1	2	58	58
South	36	14	3	1	18	0	406,875	487	547	6	0	0	0	6	75	71
Offshore	5	2	1	0	2	0	58,069	162	116	0	0	0	0	0	10	4
Michigan	13	2	0	0	5	6	27,310	208	156	2	0	0	0	2	67	47
Mississippi	7	2	0	1	4	0	74,003	234	197	3	0	0	1	2	76	91
Montana	9	5	0	1	3	0	45,750	73	79	3	1	0	0	2	35	33
Nebraska	18	5	0	0	13	0	106,487	224	210	7	0	0	0	7	89	96
New Mexico	36	20	2	7	6	1	179,382	540	520	9	2	1	0	6	76	51
West	16	4	1	7	3	1	65,820	182	.....	4	1	0	0	3	17	.....
East	20	16	1	0	3	0	113,562	358	.....	5	1	1	0	3	59	.....
New York	0	0	0	0	0	0	0	100	97	0	0	0	0	0	7	8
North Dakota	3	1	0	0	2	0	9,603	87	134	2	0	0	0	2	15	29
Ohio	16	6	0	3	6	1	35,418	326	275	1	0	0	0	1	15	8
Oklahoma	94	53	2	11	26	2	357,429	1,085	1,735	7	2	0	1	4	197	270
Pennsylvania	57	18	0	23	9	7	186,901	185	163	1	0	0	0	1	7	3
South Dakota	1	1	0	0	0	0	8,439	14	.....	0	0	0	0	0	5	.....
Texas	319	167	13	10	117	12	1,221,567	4,664	5,634	60	3	2	1	54	957	1,071
District 1	24	11	0	1	12	0	48,362	336	360	5	0	0	0	5	120	92
District 2	8	3	0	0	4	1	48,507	199	225	2	1	0	0	1	47	68
District 3	19	7	2	1	9	0	114,543	352	327	4	0	0	0	4	72	82
District 4	19	9	4	1	5	0	100,378	354	345	1	0	0	0	1	102	95
East	22	7	1	0	14	0	87,982	330	324	6	0	1	0	5	69	71
District 7-B	62	28	1	4	29	0	152,216	685	793	14	0	0	0	14	197	211
West	96	68	2	1	23	2	452,551	1,254	1,761	21	2	1	1	17	204	213
District 9	49	24	0	1	15	9	118,132	859	1,069	7	0	0	0	7	122	200
District 10	20	10	3	1	6	0	98,896	295	430	0	0	0	0	0	24	39
Utah	5	4	0	0	1	0	25,006	74	115	1	0	0	0	1	26	34
West Virginia	16	0	0	10	6	0	44,133	226	209	1	0	0	0	1	2	6
Wyoming	11	4	0	0	7	0	69,587	271	242	7	0	0	0	7	113	78
Miscellaneous	0	0	0	0	0	0	0	24	22	0	0	0	0	0	22	17
Total U. S.	**813**	364	21	79	318	31	3,422,188	12,297	14,203	**159**	11	3	4	141	2,700	2,739
Prev. week	689	288	30	51	311	9	3,379,122	.....	.....	164	5	6	6	147	.....	.....
Cum. 1960	12,297	5,711	401	1,043	4,784	358	54,141,731	.....	.....	2,700	232	31	80	2,357	.....	.....
Cum. 1959	14,203	7,162	371	1,008	5,282	380	59,912,726	.....	.....	2,739	280	38	92	2,329	.....	.....
Western Canada	20	12	0	2	6	0	126,351	722	742	6	1	0	1	4	225	283

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	4-9-60	4-2-60	4-11-59
Pennsylvania	2,084	2,075	2,513
Other Appalachian	1,701	1,775	1,475
Illinois, Indiana, Michigan	9,537	9,414	8,803
Nebraska and North Dakota	2,583	2,696	2,116
Kansas	9,692	9,464	8,844
Oklahoma	17,421	17,458	16,632
Arkansas	2,248	2,007	1,693
Louisiana	19,548	20,226	18,927
North	3,383	3,341	3,071
South	16,165	16,885	15,856
Mississippi, Alabama, Florida	2,689	2,797	2,408
New Mexico	7,749	7,916	8,520
Texas	110,117	112,147	109,270
East Texas	8,301	8,489	9,064
West Texas	49,521	50,615	52,795
Texas Gulf	19,992	20,060	17,655
Other Texas	32,303	32,983	29,756
Wyoming	17,358	17,423	13,725
Other Rocky Mountain	9,756	9,640	9,264
California	29,120	29,350	34,431
Foreign	†14,570	13,839	15,233
Total	**256,173**	258,227	253,854

*Bureau of Mines. †Includes 4,048,000 bbl. in California.

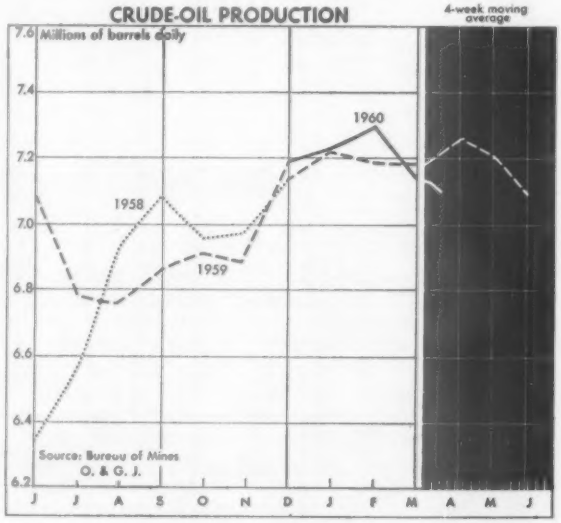
DAILY AVERAGE PRODUCTION FOR WEEK

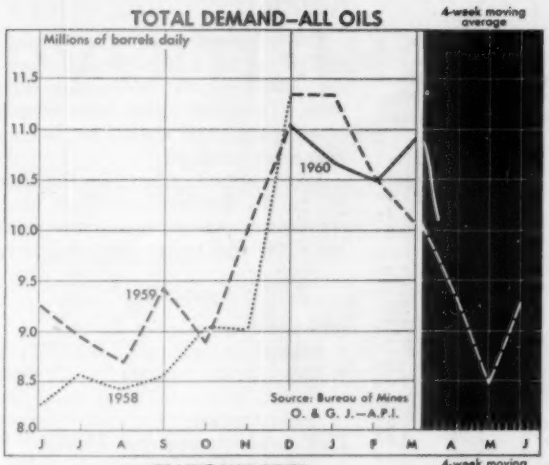
	April 16, 1960 Crude oil	Lease condensate	Total	Apr. 9 total
Alabama	19,250	.....	19,250	19,225
Arkansas	82,400	150	82,550	82,700
California	831,000	.....	831,000	829,500
Colorado	128,900	.....	128,900	129,500
Eastern	39,300	.....	39,300	39,600
Florida	1,100	.....	1,100	1,100
Illinois	216,200	.....	216,200	213,800
Indiana	34,300	.....	34,300	33,700
Kansas	†325,310	.....	†325,310	†327,270
Kentucky	63,800	.....	63,800	62,600
Louisiana	966,300	136,200	1,102,500	1,101,750
North	108,300	6,200	114,500	113,750
South	858,000	130,000	988,000	988,000
Michigan	31,800	.....	31,800	31,800
Mississippi	129,700	4,700	134,400	133,800
Montana	79,000	.....	79,000	79,000
Nebraska	61,900	.....	61,900	61,400
Nevada	100	.....	100	100
New Mexico	304,000	7,500	312,000	312,000
North Dakota	55,200	.....	55,200	56,000
Oklahoma	†531,000	.....	†531,000	†545,900
Texas	2,459,500	91,675	2,551,175	2,551,175
Dist. 1	41,500	3,700	45,200	45,200
Dist. 2	110,000	8,600	118,600	118,600
Dist. 3	311,000	38,000	349,000	349,000
Dist. 4	174,800	18,000	192,800	192,800
Dist. 5	27,500	500	28,000	28,000
Dist. 6	105,800	10,000	115,800	115,800
East Texas field	132,000	.....	132,000	132,000
Dist. 7-B	122,200	250	122,450	122,450
Dist. 7-C	120,100	3,225	123,325	123,325
Dist. 8	1,016,400	5,900	1,022,300	1,022,300
Dist. 9	191,200	2,400	193,600	193,600
Dist. 10	107,000	1,100	108,100	108,100
Utah	110,000	.....	110,000	108,700
Wyoming	328,300	.....	328,300	326,200
Others	‡1,400	.....	‡1,400	‡1,400
Total U. S.	6,800,260	240,225	**7,040,485**	7,048,420
Change from previous week, down			**7,935**	.....
Canada	†520,000	.....	†520,000	†480,000

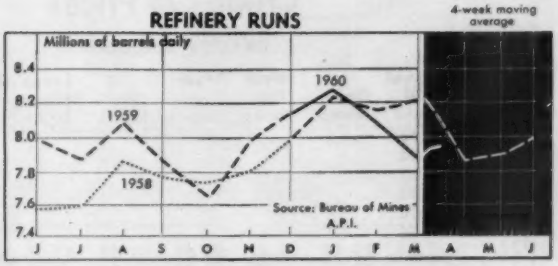
Total U. S. prod., January 1-April 16 ..... 768,768,900 bbl.
Same period last year (crude plus cond.) ..... *764,353,600 bbl.

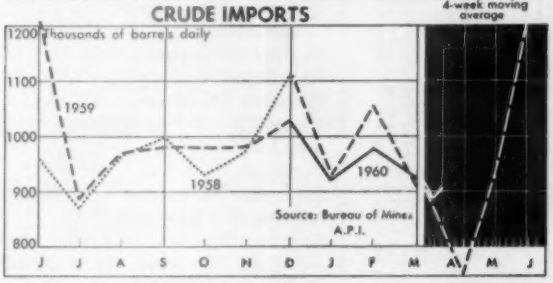
*Includes 20,571,850 bbl. condensate. †Week ended previous Monday. ‡Alaska and South Dakota.

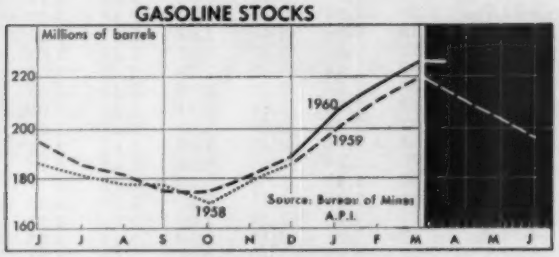
CRUDE-OIL PRODUCTION

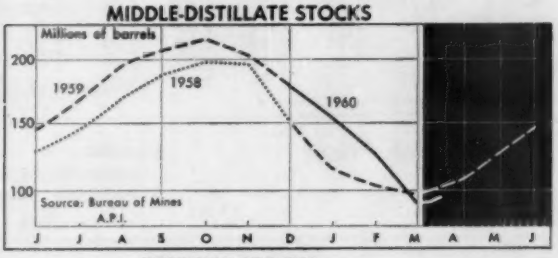


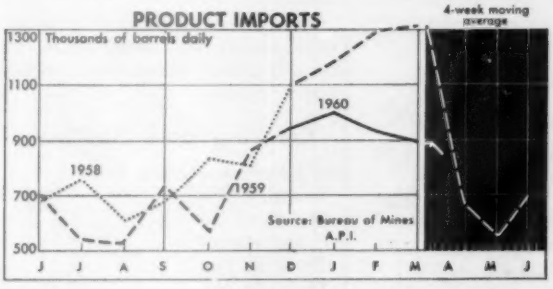


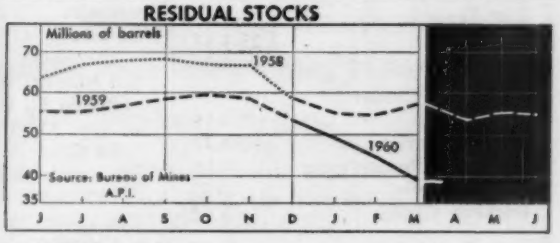












API REFINERY REPORT—APRIL 15, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, April 1959 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,052	515.7	21.7	306.6	183.0	46,187	7,070	23,637	10,432	1,114	489.4	35.1	304.8	167.2
Appalachian:														
District 1	105	44.4	4.7	23.6	11.3	6,054	488	1,815	309	84	31.7	2.9	19.2	8.7
District 2	73	41.9	6.0	14.4	14.0	2,912	303	725	405	91	42.3	5.5	16.5	11.8
Ind., Ill., Ky.	1,471	755.8	74.4	322.1	160.7	44,314	3,414	12,241	3,296	1,421	723.0	68.0	286.5	156.3
Minn., Wis., Dak.	124	61.8	6.4	29.3	16.4	6,778	523	2,310	597	92	43.4	5.6	21.4	11.9
Okla., Kans., Mo.	695	370.3	14.6	153.1	11.7	22,065	718	7,060	916	698	353.5	16.1	158.9	17.5
Inland Texas	262	199.1	11.4	35.6	21.9	8,517	501	1,393	2,416	261	192.8	6.4	47.9	20.5
Tex. Gulf Coast	1,852	917.9	102.8	434.7	151.8	29,546	2,357	8,986	4,860	1,904	966.5	77.8	472.1	164.5
La. Gulf Coast	703	450.1	56.7	157.9	76.1	12,145	1,381	2,774	905	689	363.8	45.3	150.3	43.4
N. La. and Ark.	97	48.3	5.4	18.0	5.1	5,471	622	1,919	129	106	49.0	5.1	22.8	6.3
Rocky Mtn.:														
New Mexico	24	15.1	0.6	4.7	2.3	877	51	137	136	21	11.9	0.3	4.0	2.1
Other	284	118.4	2.3	60.8	32.9	7,978	229	2,291	890	251	110.1	1.6	55.9	31.5
West Coast	1,156	528.6	35.1	189.0	278.6	31,953	1,196	11,090	13,800	1,136	508.4	6.0	179.4	295.3
Apr. 15, 1960	7,898	4,067.4	342.1	1,749.8	965.8	224,797	18,853	76,378	39,091	7,868	3,885.8	275.7	1,739.7	937.0
Apr. 8, 1960	8,035	4,097.1	393.6	1,805.4	987.6	224,995	18,221	74,419	39,373	.....	.....	.....	.....	.....
Apr. 17, 1960	7,856	3,927.3	276.6	1,833.3	915.7	212,742	19,846	81,518	56,430	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.76	....	....	....	....	....	....	....	....
15-15.9	1.84	....	....	....	....	....	....	....	$1.81
16-16.9	1.92	....	....	....	....	....	....	....	1.86
17-17.9	2.00	....	....	....	....	....	....	....	1.91
18-18.9	2.08	....	....	....	....	....	....	....	1.96
19-19.9	2.16	....	....	....	....	....	....	....	2.01
20-20.9	2.24	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.32	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.39	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.55
Middle District	4.37
Southwest Pennsylvania	4.10
West Virginia	3.92
Buckeye Grade	3.92
Illinois Basin	**3.00**

Foreign

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.90
Iranian, 34.0°-34.9°, Bandar Masur	1.80
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Gulf-NY, clean (ATRS +5.0%)	$2.99
★ Gulf-NY, dirty (ATRS flat)	2.85
★ Carib.-NY, dirty (ATRS −55.0%)	1.24
★ Carib.-UK, clean (Scale −40.0%) (19s. 6d.)	2.73

★ Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):	
★ Regular (91 octane)	10.75-11.25
★ Premium (99 octane)	13.25-14.00
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.25-10.50
Regular (92 octane)	10.50-10.75
Premium (98 octane)	11.25-11.75
California (rack) Los Angeles):	
Regular (88 octane)	11.65-12.15
Premium (94 octane)	12.65-13.15
Premium (100 octane)	14.00-14.65
Caribbean area (cargoes):	
★ Regular (87 octane)	10.00
★ Premium (97 octane)	11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):	
Kerosine 42-44	9.00-9.50
Diesel oil (58 d.i. and above)	8.75-9.25
Distillate No. 1	8.75-9.25
Distillate No. 2	7.75-8.25
Gulf Coast (cargoes):	
★ Kerosine 41-43	8.625-9.00
★ Distillate No. 2	7.625-8.00
New York Harbor (barges):	
Kerosine 41-43	9.8-10.3
Distillate No. 2	8.8- 9.3
Diesel fuel, 48-52 d.i.	9.1- 9.6
Caribbean area (cargoes):	
Distillate No. 2	8.00

Residual Fuel (Bbl.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.70-1.80
Gulf Coast (cargoes):	
★ Bunker C fuel	2.10-2.25
New York Harbor (barges):	
Bunker C fuel	$2.47
Caribbean (cargoes):	
Bunker C	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.15

★ Denotes change from previous week.

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14—3¾"	x ⅜"	wall x 44' long
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200,000 ft.	8 5/6"	28#
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1	Stab. TWR-OVHD Condenser	430	" "
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2	Bubble Tower—BTMS Cooler	745	" "
1	Stab. Bottoms Cooler	1150	" "
1	Vir. Gas Oil Pumparound Cooler	630	" "
1	Kerosene Cooler	460	" "
4	Rerun TWR-OVHD Condenser	840	" "
2	Lt. Flash Distillate Condenser	840	" "
1	Gland Oil Cooler	460	" "
1	Poly. Feed Condenser	870	" "
1	Inter. Flash Dist. Cooler	840	" "
2	Lean Oil Cooler	1167	" "
2	Afterfrac. Twr. OVHD Cooler	957	" "
1	Butane Vaporizer	228	" "
1	Kero. Cooler	567	" "
1	Compressor Inter Cooler	283	" "
2	Eng. Water Cooler	91	sq. ft.
1	Butane Vaporizer with steel tubes	224	" "
2	Inter. Flash Distil—Rich Oil Exchanger	202	" "
1	Stab. Bottoms—Stab. Feed Exchanger	456	" "
1	Lean Oil—Rich Oil Exchanger	380	" "
1	Center Steam Generator	1370	" "
1	Crude Fl. Twr.—OVHD Crude Exchanger	2205	" "
1	Gland Oil with red brass tubes	460	" "
1	Gas Oil Cooler	254	" "
1	Inter. Flash—Distill. Cooler	840	" "
1	Stab. Bottoms Cooler	500	" "
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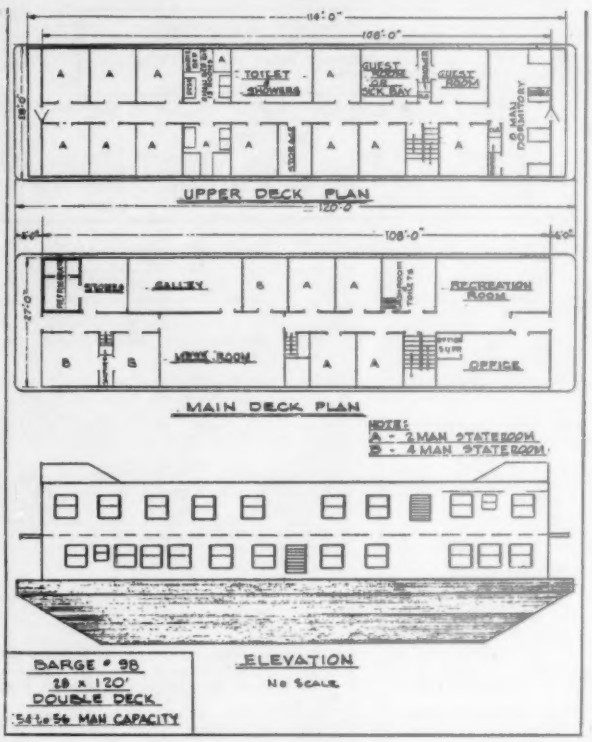

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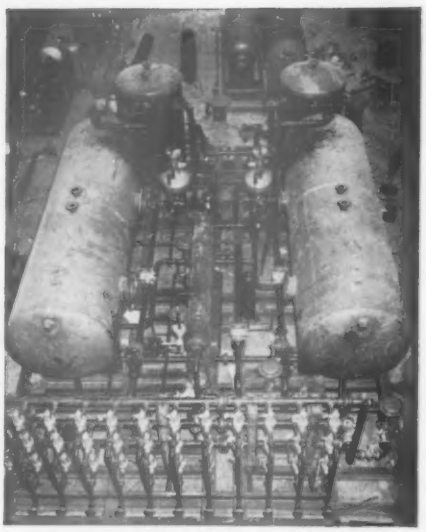

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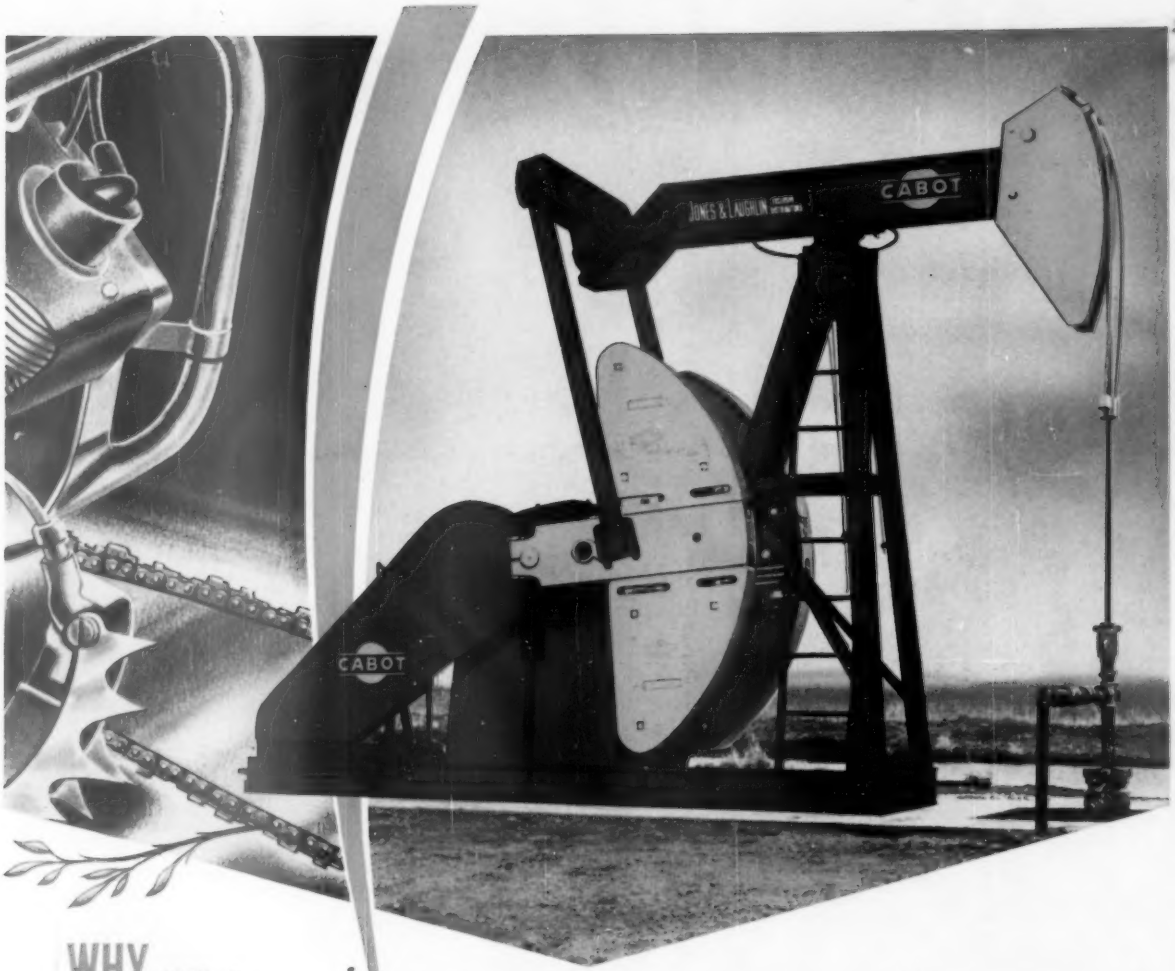

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